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Electrical World

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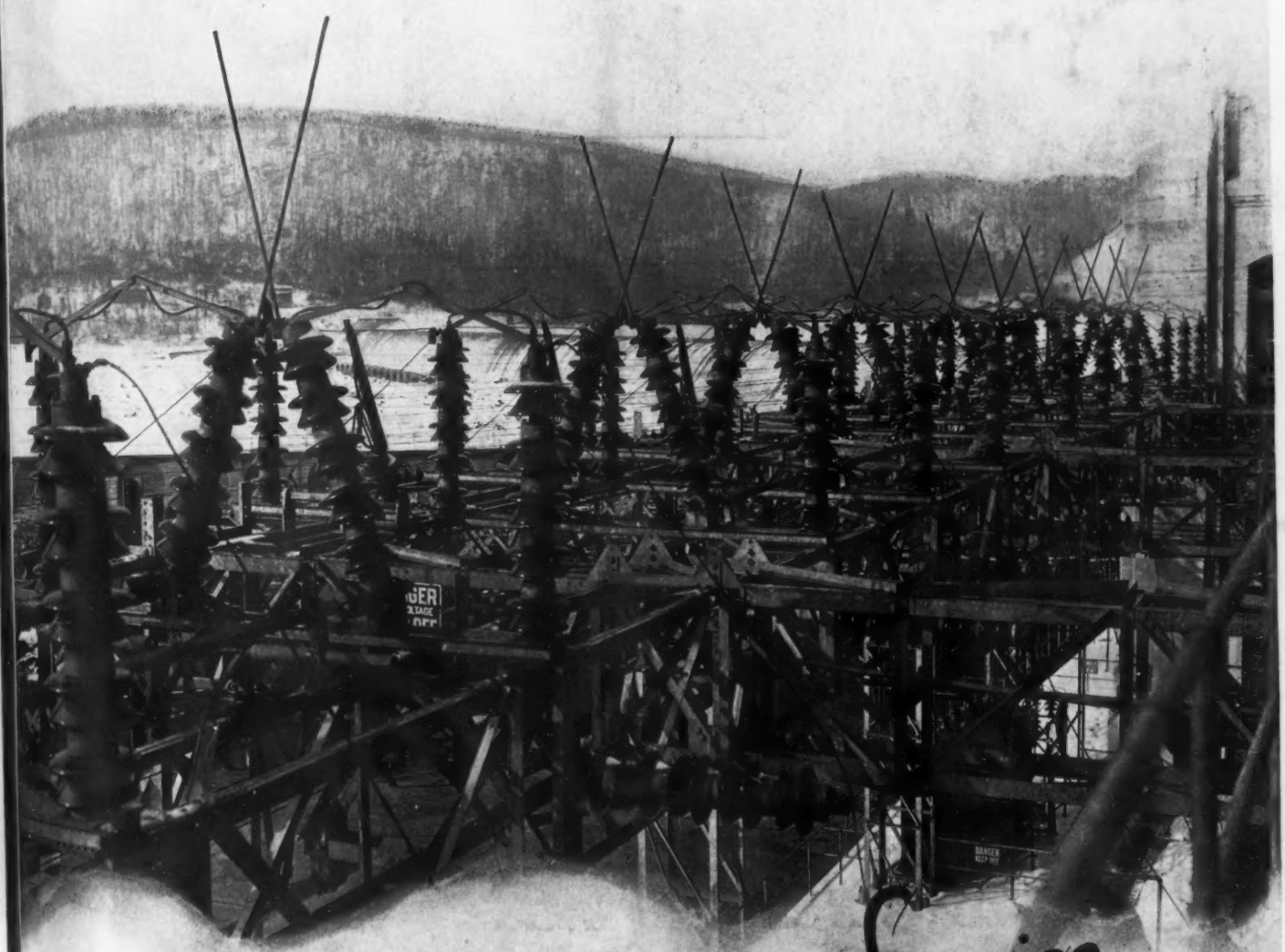

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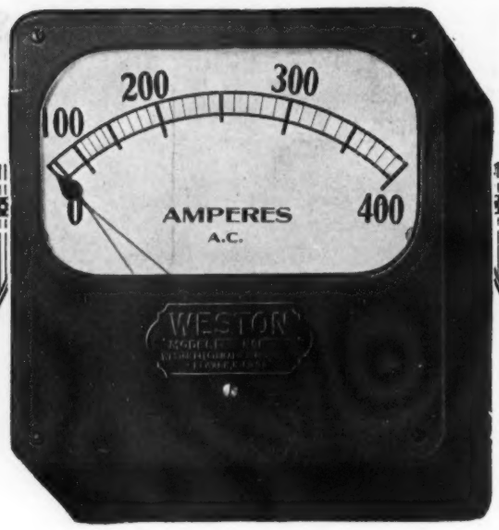

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Electrical World

THE CONSOLIDATION OF ELECTRICAL WORLD, ELECTRICAL ENGINEER AND AMERICAN ELECTRICIAN

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W. H. ONKEN, JR.
Editor

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The Passing of Oliver Heaviside

WITH the death of Oliver Heaviside the world has lost one of the greatest mathematical physicists of all time. Known personally to fewer than a dozen people, he had lived a retired life for forty years, He received no conventional education, which largely accounts for his unconventional writings. These fill five large volumes. They treat of a variety of subjects, and their fame is due largely to his papers on the theory of the telephone and the discovery of the distortionless circuit. It was an extraordinary discovery, somewhat like Kelvin's *KR* law for submarine cables. It was made forty years ago, when there were but few who understood electrical theory. He restated the theory in 1893 in a marvelously simple and clear manner.

He laid the cornerstone for long-distance telephony. Able mathematicians and physicists used his papers, and naturally, however willing to give him credit they may have been, the originator, a recluse who shunned every form of publicity, was eclipsed and obscured. This is the unalterable law of the world, and thus it happened that Heaviside's name is known to but few and his passing away is left almost unnoticed. None the less, one of the greatest creative minds has ceased to be.

Federal Investigation of the General Electric Company

ALTHOUGH an honest man or an honest corporation does not fear investigation, both shun it normally as they do poison. It is only a thief that "doth fear in every bush an officer," and yet there is a feeling of dread experienced by every upright man who is accused of wrongdoing, however unfounded and unjust the accusation may be. When an individual's reputation has been dragged through the mud any vindication is poor recompense for the anguish suffered. With a corporation the damage is just as real, but it is less susceptible to quick healing. Money takes fright easily. A frivolous executive or a squint-eyed treasurer has been known to scare it away. Mere rumor causes it to flee, and many a corporation has suffered financial embarrassment on that account.

The United States Senate has ordered the Federal Trade Commission to investigate the General Electric Company, including its stockholders, to determine what control the company exercises over public utilities and power companies. The General Electric Company has come through investigations before and, despite what has just been said, one more probably carries no terror to the company and may result in some good. We doubt whether any corporation knowingly or willingly tries to break the law. Modern business is very complicated, and the Federal Trade Commission offers no guide for action in untried cases. It is only through court decisions that business practices come to be firmly established or rejected, and of the many corporations in the electrical industry the General Electric Company is in as good condition as any to court investigation and has as little to fear. It is questionable, however, how far the government can go in investigating the private business affairs of a stockholder, and it is surely unfortunate that the Senate insisted upon the inclusion of stockholders in the investigation. The individual can stand on his constitutional rights, but the general effect of that part of the Senate resolution will be to frighten stockholders and make it harder for all business to obtain financial backing. There is no sense in shooting up a whole town in an endeavor to make one arrest.

Getting Bigger Return from Plant Investment

SOME utility men have said that their new plants, which were built at a considerably higher unit cost than older ones, have surplus capacity which must be loaded up to bring a return on the investment. Others contend that they cannot take on any additional load which increases the peak demand. In either case, however, those who have carefully considered the economics of the situation maintain that with the higher investment per kilowatt of plant capacity it will be necessary to increase system load factor, or the owners of new stations will find it necessary to increase rates. When actually faced with this alternative most utilities will spare no efforts to find ways of increasing the utilization of generating and service equipment and hence to build up the return per dollar invested.

The trend toward interconnection of adjacent or contiguous systems has been a great benefit in this direction. Not only has it increased diversity factor by superposing system loads, but it has permitted the use of less standby or reserve equipment and consequently made possible a larger output per kilowatt installed. Analysis of station equipment outages and precautions taken to reduce them are also permitting greater return per dollar invested.

Sales of power, large as they have been, have not always been conducted with the same thought toward maximum utilization of generating and service equipment. Under the condition mentioned at the outset the sales departments of utilities will have the largest incentive and opportunity to increase the output per kilowatt of service equipment. Sales departments have never been faced before simultaneously with more load than can be carried and excessively high fixed charges per kilowatt installed, and it is not surprising that they have made no outstandingly strenuous efforts to seek or develop loads which will increase the system load factor. But such loads are needed now. If the plants are loaded to peak capacity, they need off-peak

loads. What those loads are and how they are to be had no one has told, at least loud enough to command national attention.

Faced with the undesirable alternative of increasing rates, it may be confidently expected that the analytical minds and aggressive sales talent in utility organizations will blaze a trail for insuring bigger return from plant investment. To change the metaphor, this will be to them a monument which bears no epitaph.

Wanted—A Midnight Load

MORE than eleven and a half billions of capital invested in the light, power and traction industry earns no returns for about half the time because the world must sleep. Last year in the central-station industry about sixteen million kilowatts of station capacity was used to sell customers forty-three billion kilowatt-hours at an average price of three cents per kilowatt-hour. If this equipment had been used all the time at full load, customers could have purchased three and one-half times the energy actually absorbed and the additional energy could have been sold with profit at about one and one-half cents per kilowatt-hour.

A poor load factor is the greatest handicap to economic efficiency in energy production and utilization, and this poor load factor is inherent in modern affairs. It would not be well for half the nation to work in darkness, and human welfare outweighs economic efficiency. Custom and habit work against night labor by human beings. This being granted, there remains the possibility of a genius inventing some machine or some process that will use an enormous amount of electricity between midnight and morning without requiring human attendance. While waiting for this accomplishment there remain certain types of loads which could be utilized to a greater extent to make the load curve uniform. One of these is the use of battery-charging stations for trucks, stationary batteries and even ignition batteries. If rates and sales policies are fully utilized, a very great improvement may be realized on many systems. Electrical refrigeration and certain industrial process loads also offer worth-while possibilities.

Granted that there is nothing that fully meets the situation, nevertheless each system can find certain kinds of good business for night loads, and every effort should be made to improve conditions. Everything possible should be done to apply electricity while the world sleeps.

Approaching Ideals in Sales

SALESMEN in the electrical industry do not take horse traders of the David Harum type as their model, and more and more they use customer service to replace "bunk" in their sales talks. Today it is realized that nearly every man in the electrical industry is concerned with sales of electric service and equipment upon a basis which gives best results to the buyer as well as the seller. Yet the very magnitude of the industry introduces so many kinds of service and equipment that it is difficult to find the time and the personnel for obtaining best results in sales. There remains a great deal of "over-the-counter" selling, and there is still ample room for maintaining customers' service in the best manner. Among the manufacturing and utility companies alike equipment engineers and high-grade salesmen are few in number and find their time fully occupied with the big jobs. Utility executives and experienced power salesmen find their time well occupied with the larger customers already served or in prospect.

Thus many young and inexperienced salesmen sell the greatest volume of equipment and service in the industry, and it is important that they be educated continuously in modern sales methods and ethics. They should place customer service first in their sales manual and should strive to be with their customers a large part of the time in order to get first-hand the views of customers on the operation of equipment and their response to all the efforts of the company to serve them.

Endeavors on these lines eliminate waste very directly and also instill principles in the younger men of the industry which will make for its correct development. More schools for salesmen in manufacturing establishments and on utility properties are needed if full advantage is to be taken of existing possibilities.

Electricity Promises Much in the Preservation of Health

TWENTY years ago few persons suspected that electricity would some day be a great direct factor in conserving life and health. However, that day has dawned with rosy promise. Civilization has ever been a process of replacing a natural environment by an artificial one. In fact, civilization may be measured by the degree of this replacement as well as in any other way.

Man is biologically a creature of sunlight, and it begins to appear as if his indoor life has robbed him of some of the vitalizing action of solar radiation. If this be true, civilized human beings are bound to pay the penalty of lowered vitality, poorer health and shorter life. Much research is still necessary before the complete relation of the many cells and processes in the human body to various radiations can be laid bare. Many interesting facts, however, are already available. For example, rickets is proved to be due in part at least to lack of sunlight. Electric sources of ultraviolet radiation, such as the quartz mercury arc, are already doing much as a substitute for sunlight in the prevention and cure of rickety bones. Ultra-violet and other radiation also favorably influence many reactions in the body processes upon which life depends. X-rays are used today as much for treating disease as they are in their earlier applications of photography and fluorscopy. The germicidal action of certain ultraviolet radiations is now well known and utilized. Many other applications of radiation are being studied or anticipated by research.

All these sources of radiation which are already being used for preserving and restoring health and thereby conserving human life are electrical and man-made ones with the exception of radium. Even to those who think in terms of kilowatt-hours the total present consumption of electrical energy by incandescent filament lamps, X-ray tubes, quartz mercury arcs and other arcs, in sterilization and in the many phases of radiation-therapy, would doubtless be surprisingly large. It is still more fascinating to note the promise of the future.

Electricity is serving mankind very well in supplying light, heat and power, but, after all, the health of human beings is their rarest treasure. The glowing prospect of electricity as a direct aid to health may well augment pride in its past accomplishments in this field. By means of it man is providing radiations not available in nature and through research is finding uses for them. No greater service can be rendered than by investigating and applying them to the preservation of health.

Has a New Power-Sales Method Developed?

TO BRING home to the listener the value of purchased power it has been repeatedly declared by men who have accomplished results that utility representatives must know the prospective customer's production problems and present specific experience and cost data which will convince him that power so obtained can be economically used in his business. Such sales ammunition can be obtained by studying existing consumers' experiences and making them available to the whole sales staff. If the local experience has not been sufficient to furnish these data, they may be found in the territory of other companies.

Unfortunately, we believe, few companies have collected these experiences in such form that they will be available to their entire sales staff. Too many individuals carry all such information in their heads, and it leaves the company when they leave. As a consequence there is little opportunity for exchange of information between utilities. Does this mean that these companies have found it unnecessary to present specific experiences and data in selling power? If so, many utilities would be glad to know what the alternative sales method is, especially those companies which have little money to spend in collecting data.

Knowing All About Gelatine

A VISITOR was once shown through the research laboratories of a large industrial non-electrical organization, and the director of research, who acted as guide, took him into one of the rooms and said: "This is our gelatine room, and the four Ph.D.'s whom you see here are experts at it. As you know, gelatine plays an important part in our product, but these men are not directly concerned with factory processes or difficulties. Their task is to know all that can be known about gelatine and methods of its analysis. We consider it to be of great importance to develop theoretical specialists who know all about gelatine. Then when a factory difficulty or an outside problem arises, these men either already understand, from their knowledge of the subject and its literature, what to do, or else they have the necessary apparatus, books, expert skill and so forth and know exactly how to go at the problem."

This broad-minded point of view deserves wide emulation on the part of the manufacturing, operating and holding companies of the electrical industry. With growing concentration of effort this method of dealing with troubles becomes both the most rational and the least expensive in the end. A very important distinction exists, however, between the "gelatine" method and the one which actually obtains in many cases. In a small manufacturing company an engineer may design all kinds of machinery, and then, as the company grows and the designing staff increases, he (or one of his successors) may be gradually limited to, say, induction motors of a certain type, between 5 hp. and 25 hp. The kind of expert which this man becomes is just the opposite of the gelatine expert described above. Instead of becoming more scientific, such a designer may become more and more empirical, making his motors "a little bigger here and a little smaller there." What such a company needs, in addition to specialized designers, is a theoretical expert who knows all about induction machines as a piece of physical apparatus, without any reference to a particular size or type, who is familiar with the primary and secondary phenomena in them, who knows the exact electrical relations and the analytical and graphical methods of representing them, has the foreign literature at his fingers' tips, and all the time studies the induction machine as such. The same thing applies to cables, switches, insulators, transformers, etc. Moreover, operating and construction companies need such thorough theoretical experts just as much as manufacturing companies do, because their problems and points of view are quite different.

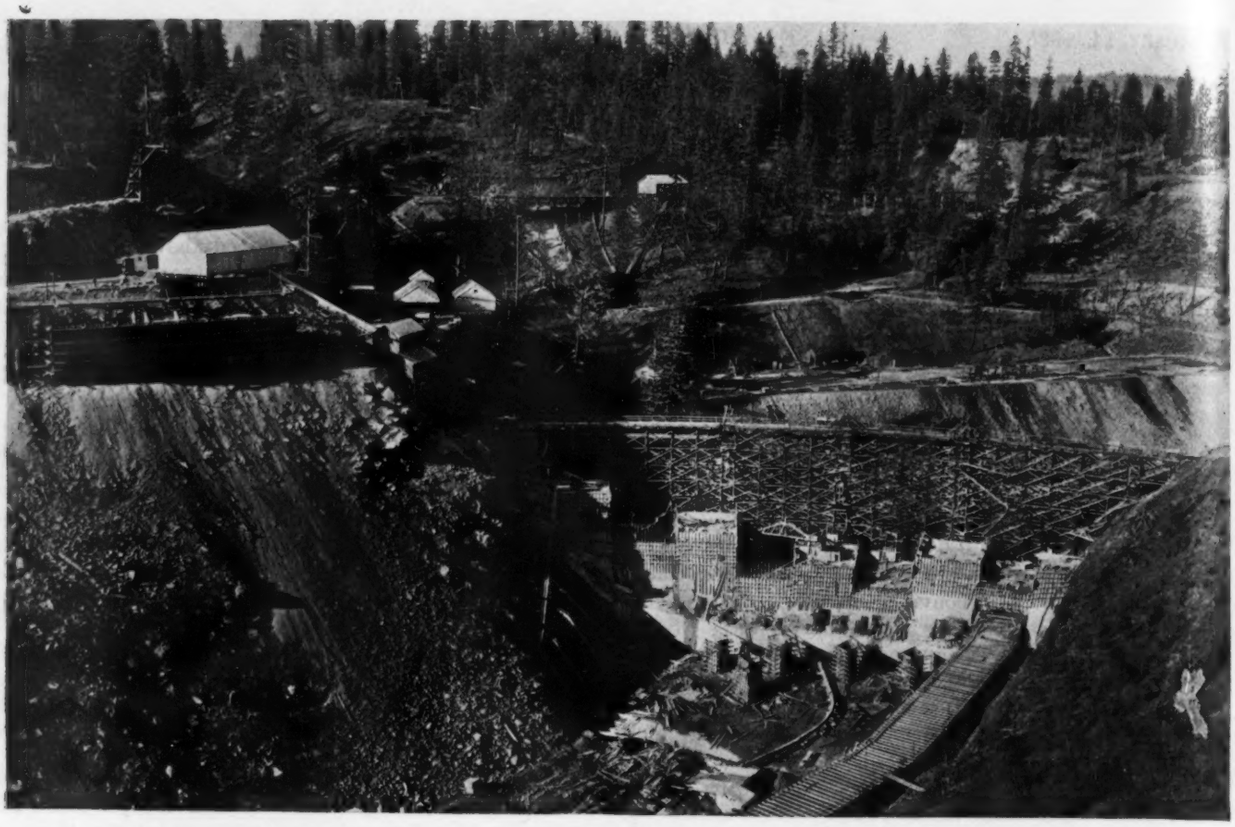
Advantage of Artificial Light in Show Windows in the Daytime

UNTIL twenty years ago artificial light was considered something to be used only when daylight failed. Everywhere, except in mines, tunnels and other subterranean places, the function of artificial light was to extend the "day" somewhat. But the great increases in the luminous efficiency of light sources which have been achieved within the present century have radically changed this viewpoint. Many stores, offices and factories in our cities use a great deal of artificial light during their operating hours regardless of the daylighting conditions outdoors. Of course, on sunny days less artificial light is needed in most of these places than on cloudy days.

The show window, however, is a place where the contrary is generally true. All are familiar with the annoyance of bright images of exterior surfaces reflected from the glass in show windows. These often cause such a veiling brightness that the display cannot be seen satisfactorily from outdoors. The brighter the objects, the brighter are the reflected images; therefore the condition is particularly annoying on a bright, sunny day.

A practical solution is to illuminate the display by means of artificial light to an intensity which will make its brightness so great as to render the brightness of the reflected images of exterior surfaces negligible. It is readily seen that if the display and its background possess high reflection factors, less artificial light is needed than if they are of low reflection factor. The intensity of artificial illumination necessary, as has been pointed out, depends upon various factors. It must be of the order of magnitude of 100 to 500 foot-candles and sometimes even greater.

Such installations are in existence, and it is likely that they will rapidly increase in number. Show windows are an important factor in merchandising, and merchants cannot afford to have them ineffective when they can be made effective by reasonable expenditures for artificial light.



Pit River No. 3 Hydro-Electric Development

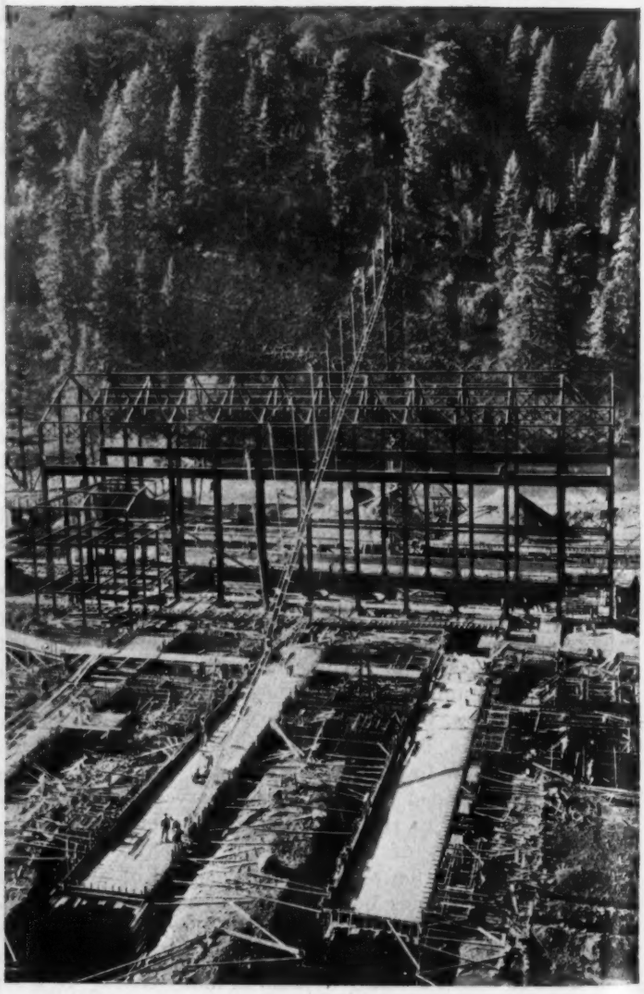
THE second major development of the Pacific Gas & Electric Company on the Pit River in northern California is now well along toward completion. The accompanying illustrations, taken recently, show some interesting phases of the construction work. The power house will contain three 29,000-hp., vertical-reaction turbines operating under an effective head of 290 ft., driving three 27,000-kva. generators.

A 112-ft. concrete dam will create a storage reservoir, from which water will be carried 21,000 ft. through a 19-ft.. concrete-lined pressure tunnel to the surge tank above the power house. A double-circuit 220-kv. transmission line, 8 miles in length, will tie the plant in with the existing 220-kv. Pit River transmission line. The No. 3 plant will bring the development up to over 200,000 hp., out of a proposed 600,000 hp.

Above—Concrete diversion dam of the spillway type on the latest Pit development.

At Right—View of Pit River No. 3 power plant.

At Bottom—A rock section on the four-mile tunnel.



Balanced Relay System for 220-Kv. Lines

Part I

Relay and Automatic Flashover Control Equipment on Big Creek Trunk Transmission Lines Described—Experience Cited Shows Satisfactory Functioning of Protective System

By E. R. STAUFFACHER and F. H. MAYER*

THE control of accidental grounds and short circuits, or, as they are termed, "flashovers," to prevent unnecessary interruptions to service is one of the most vital problems in the successful operation of a transmission system. The application of protective relays to handle short circuits on the 220-kv. Big Creek lines of the Southern California Edison Company has proved successful in eliminating interruptions on this most important trunk line.

The Big Creek lines consist of two 220-kv., 270-mile, single-circuit steel-tower lines, running from Big Creek, in the Sierra Nevada Mountains, in central California, to two terminal substations, known as Eagle Rock and Laguna Bell, at the northerly and easterly edges of the city of Los Angeles. The electrical connections of the lines, power houses and substations, with major apparatus, are shown in Fig. 1. The two Big Creek lines were originally built for 150,000-volt operation and operated at this voltage for about nine years. As a result of growth of load it was found necessary either to build a duplicate 150-kv. line or to adapt the 150-kv. lines to 220-kv. operation.

After a careful study it was decided that the saving in capital expenditure which would result from changing the lines to 220 kv. as against a duplicate 150-kv. line was so marked as to justify going ahead on a basis of the higher voltage. A special committee was appointed, known as the 220-kv. committee, for the purpose of working out the details of the change from the standpoint of design, construction and operation.

In May, 1923, the Big Creek lines were put into operation at 220 kv., and they have been performing successfully since that time. At Big Creek No. 1 and Big Creek No. 2 power houses 150-kv. to 220-kv. auto-transformers were connected between the 150-kv. bus and the transmission line. The same scheme was followed at Vestal substation at about the center of the line and at Eagle Rock substation, one of the terminal points. At the Big Creek No. 8 plant the equipment was purchased after it had been decided to raise the line to 220 kv.; consequently the main step-up two-winding transformers were designed for operation at this higher voltage so that auto-transformers would not be necessary. At Big Creek No. 3 the main transformers were designed to transform directly from the generator voltage to 220 kv., as this plant was under construction at the time the transmission line was changed over to operate at the higher voltage. The Laguna Bell terminal substation was provided with two banks of two-winding transformers to step down

*Protection engineer and electrical designer Southern California Edison Company, Los Angeles.

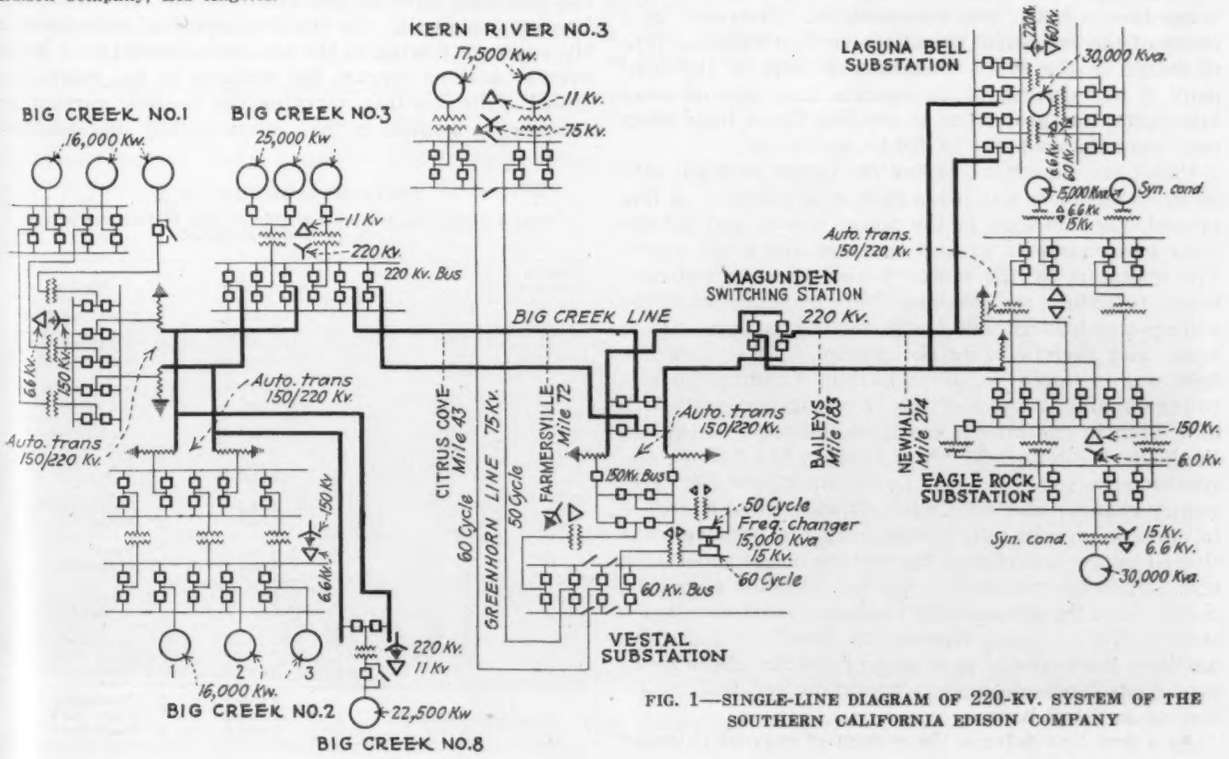


FIG. 1—SINGLE-LINE DIAGRAM OF 220-KV. SYSTEM OF THE SOUTHERN CALIFORNIA EDISON COMPANY

directly from 220 kv. to approximately 66 kv. For further details of electrical connections a study should be made of Fig. 1. It should be mentioned that the auto-transformers above referred to are provided with tertiary windings and connected delta.

Throughout the history of the Big Creek lines flashovers have occurred occasionally at no particular intervals and at no particular season of the year or time of day. These flashovers would result in grounding one

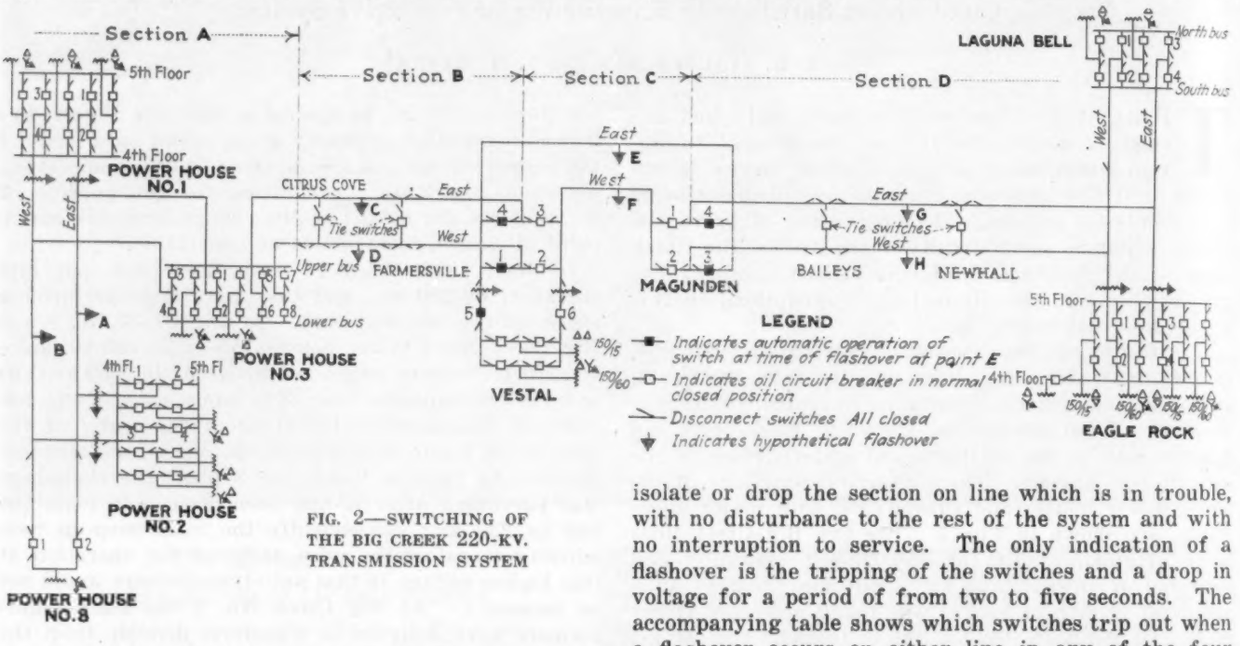


FIG. 2—SWITCHING OF THE BIG CREEK 220-KV. TRANSMISSION SYSTEM

of the wires composing one of the two transmission lines and would cause an immediate interruption to service. The operators were quite expert, however, in handling the flashovers, and the interruption would not be so long as might be supposed when the importance of this trunk line is taken into consideration. However, as a result of the successful use of the current-balanced type of relays on the 60-kv. transmission lines of the company it was decided to incorporate this type of relay installation for protection on the Big Creek lines when they were changed over to 220-kv. operation.

Under the old scheme before the relays were put into service a flashover was taken care of as follows: A line ground was indicated in the power houses and substations by means of a ground ammeter and a bell alarm. The operators at the power houses then immediately began to reduce the machine fields manually until the voltage was lowered sufficiently for the flashover arc to break and thereby clear the ground. After this the field was restored to normal, thus building up the voltage again. At two of the receiving stations which have been in operation some time—namely, Vestal and Eagle Rock—the practice was to open the field on the synchronous condenser at Eagle Rock and the frequency changer at Vestal, thus allowing these machines to operate as induction motors until the flashover was cleared by the lowering of the voltage at the generating end. When the voltage was up to normal the frequency changer and the synchronous condenser fields were again closed. This manual scheme for handling flashovers has been incorporated as a part of the automatic flashover control scheme now in operation and will be described in detail later.

As a first-line defense the system of current-balanced relays has been applied to the two lines since they were changed over to 220-kv. operation. The two 270-mile lines are divided into four sections as shown in Fig. 2. Under normal conditions the two circuits are operated in parallel, being tied in at all power houses and substations as well as at the Magunden switching station. When a flashover occurs in any one of the four sections the proper functioning of the current-balanced relays will cause the proper switches to trip automatically and isolate or drop the section on line which is in trouble, with no disturbance to the rest of the system and with no interruption to service. The only indication of a flashover is the tripping of the switches and a drop in voltage for a period of from two to five seconds. The accompanying table shows which switches trip out when a flashover occurs on either line in any of the four sections.

This relay system takes advantage of the normal condition of current balance between two lines. At each sectionalizing point balanced relays are connected to bushing-type current transformers in the oil-circuit-breaker terminals. On the occurrence of unbalance in the currents flowing in the two lines, caused by a flashover or a short circuit, the contacts of the relays are closed. The line then carrying the heaviest current, or the line in trouble, is then automatically disconnected.

SWITCHES SHOWN IN FIG. 2

These switches trip out automatically in case of flashover at any of the points indicated.

Point of Flashover	Switches	Station
A	1 and 2	Big Creek No. 1
	1 and 2	Big Creek No. 2
	2	Big Creek No. 8
	1 and 2	Big Creek No. 3
B	3 and 4	Big Creek No. 1
	3 and 4	Big Creek No. 2
	1	Big Creek No. 8
	3 and 4	Big Creek No. 3
C	5 and 6	Big Creek No. 3
	3 and 4	Vestal
D	7 and 8	Big Creek No. 3
	1 and 2	Vestal
E	1, 4 and 5	Vestal
	3 and 4	Magunden
F	2, 3 and 6	Vestal
	1 and 2	Magunden
G	1 and 4	Magunden
	3 and 4	Eagle Rock
	3 and 4	Laguna Bell
H	2 and 3	Magunden
	1 and 2	Eagle Rock
	1 and 2	Eagle Rock

At the Vestal substation the situation is somewhat more complicated than in the other substations and power houses. At this point it was necessary to balance the sum of the currents flowing in two oil circuit breakers and in one auto-transformer connected to one line against the sum of currents of the two oil circuit breakers and the remaining auto-transformer connected to the other line. By means of paralleling the current transformers this summation was accomplished successfully.

Automatic Flashover Control

To protect against this prolonged interruption an automatic flashover control system was installed. It consists essentially of relay equipment and motor-operated field rheostats which will automatically perform the operation of lowering the generator voltage at the time of a flashover in practically the same length of time that it took to handle this operation manually in the past. A master relay is so connected that it will close its contacts at the time of a flashover and thus begin the sequence of operations which will lower the generator voltage. When ground current passes through the master relay connected in the secondaries of the current transformers in the grounded neutral of the power transformers, the rheostat and exciter fields will begin to cut in the rheostats at the various generating plants until the voltage is lowered sufficiently to break the flashover, thus eliminating the trouble from the line. The master relay then returns to its original position, and the motors on the various rheostats will run the rheostats back to their original positions, thus bringing the generator voltage and consequently the line voltage back to normal. Simultaneously with the lowering of the generator voltage the condenser fields in the terminal substations and the frequency-changer field in the Vestal substation are attacked. In this case, instead of using a motor-operated rheostat, the master relay attacks the master circuit of the field regulator and automatically locks it open. When the trouble is relieved and the condenser has returned to almost synchronous speed, the master relay is released by a push-button, thus allowing the regulator again to bring the field excitation of the condensers and frequency changers back to normal. As mentioned above, the time required to handle flashovers when two lines are in parallel and the balanced relays are allowed to operate is from two to five seconds. When line conditions are such that the balanced relays cannot operate, it requires about thirty seconds to handle a flashover. Of this time ten seconds is required to bring the voltage down to where the arc will break and about twenty seconds for restoring the voltage to normal. However, a rheostat is installed in series with the motor circuits, which permits varying this time as experience dictates and makes it possible to calibrate all equipment at various plants to operate simultaneously, regardless of the characteristics of the individual generators.

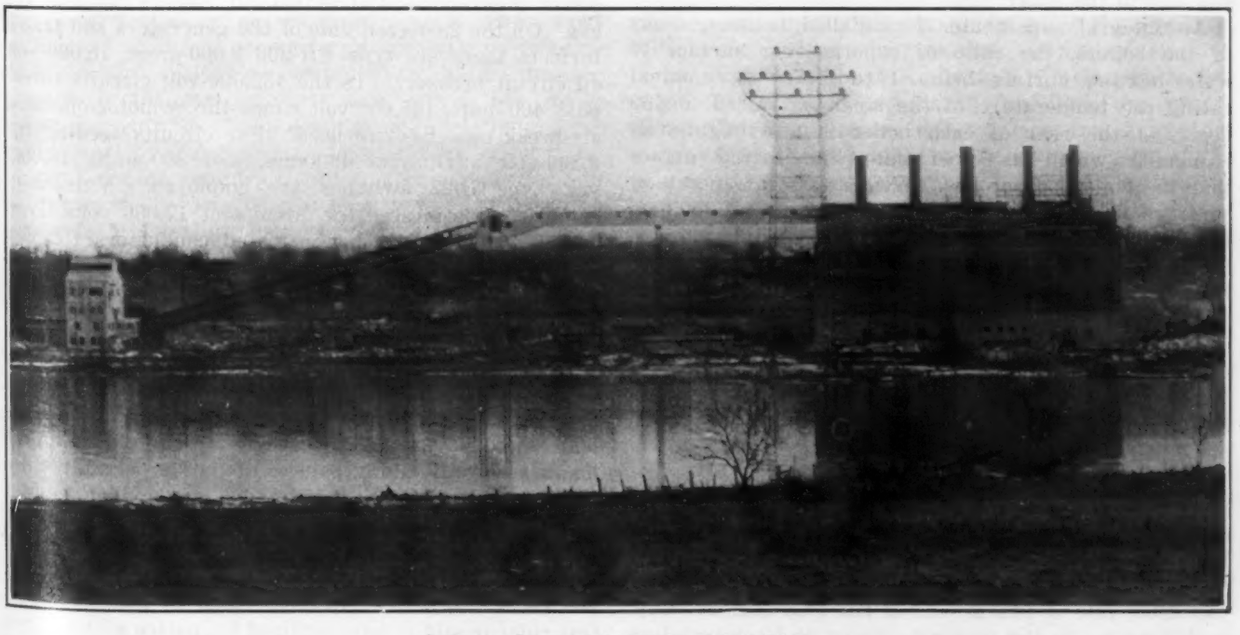
A detailed discussion describing the equipment at each of the generating plants and substations will be given in a subsequent issue.

Joliet Plant Enlarged

Public Service Company of Northern Illinois Adds 30,000-Kw. Turbo-Generator, Increasing Rating to 50,000 Kw.

ONE 30,000-kw. turbo-generator, with its complement of boilers and auxiliaries, has been added to the Joliet (Ill.) plant of the Public Service Company of Northern Illinois, which is 3 miles south of Joliet on the Desplaines River, giving the plant a generator rating of 50,000 kw. Ultimately it is expected to have two 30,000-kw. units and two 10,000-kw. units, giving a total rating of 80,000 kw.

Coal, containing 11,800 B.t.u., with 18.23 per cent ash, 61.25 per cent carbon and 4.42 per cent sulphur, is received in railroad cars and dumped or unloaded into hoppers by a gantry crane with a capacity of 180 tons per hour. From the hopper the coal is fed by a shaking feeder onto a belt bringing it to coal breakers, whence a belt conveys it to 1,000-ton "gunite"-lined steel bunkers. The coal is weighed on track scales. Accom-

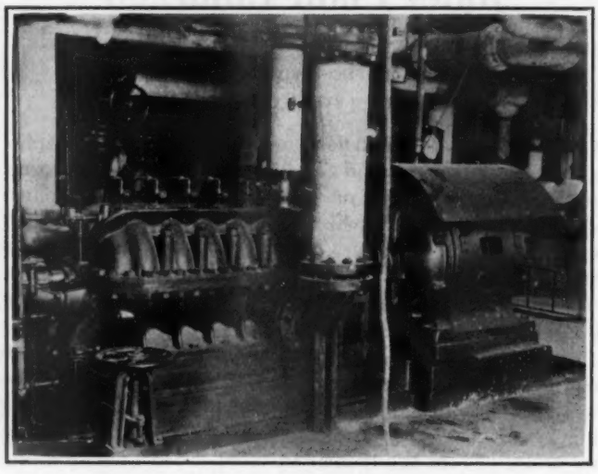


EXTERIOR VIEW OF JOLIET STEAM PLANT

modation is provided for 75,000 tons storage in the open, reclamation being made by a locomotive crane.

To burn the coal, blast-type chain grates are employed capable of burning 62.1 lb. of coal per square foot per grate per hour at a steaming rate of 150,000 lb. of steam per hour, or 337 per cent normal rating. The grate area per boiler is 383 sq.ft., making the ratio of water-heating surface to grate area 37 to 1. The stokers are driven by motor through a reduction-gear box and belt. Very high combustion chambers are employed, having 5,560 cu.ft. of volume, making the ratio to the water-heating surface 1 to 2.53 or the ratio to the projected grate area 14.5 to 1. Flat arches are used.

The boilers generate steam at 350 lb. gage pressure, but are designed for 650 lb. pressure and have 14,086 sq.ft. of heating surface divided between two decks of tubes, the lower being eight tubes high by thirty-four wide and consisting of 3½-in. tubes, the upper being seventeen tubes high by thirty-four wide and containing



MOTOR-DRIVEN BOILER-FEED PUMP

2-in. tubes. Two passes are provided in the upper deck and one in the lower deck.

An integral superheater is installed between decks of the boilers, the ratio of superheating surface to water-heating surface being 1 to 6.17. At nominal rating the temperature of the steam is raised to 700 deg. At the rear of each boiler is a wrought-steel economizer which has 63 per cent of the heating surface that the boiler proper has. With a gas entrance temperature of 590 deg. F. and exit temperature of 350 deg. F., and with a steaming rate of 150,000 lb. per hour, the temperature of the water leaving the economizer is 280 deg.

Ashes are dumped through air-operated gates into cars, and gases resulting from combustion are discharged, after passing through the economizers, into a 103-ft. self-supporting steel stack, measuring 8 ft. 6 in. in diameter at the bottom. This makes the cross-section per 1,000 sq.ft. of boiler heating surface 4.03.

The new turbo-generator, which as mentioned before is rated at 30,000 kw., has seventeen stages and is designed for 1,800 r.p.m., 300-lb. pressure and 700 deg. F. (throttle). The most economical water rate is obtained at 28,000 kw. and is 9.85 lb. At one-half load the water rate is 10.6 lb. and at full load 10.2 lb. Connected solidly to the turbine exhaust and supported on springs is a surface condenser guaranteed to condense 330,000 lb. to 360,000 lb. of steam per hour, using 73 lb. of cooling water at 70 deg. F. per pound of steam. A condensing surface of 52,000 sq.ft. is provided in each condenser by 1-in. seamless brass tubes, providing 1.733 sq.ft. of condensing surface per kilowatt. The amount of steam condensed per square foot of condensing surface is approximately 0.65 lb. Steam evacuators are used for removing the air.

Condensate is pumped from the condenser through a bleeder heater, gland heater, the de-aërating system and economizers to the boilers. The bleeder heater is fed by steam bled from the fourteenth stage of the turbine. The gland heater receives gland steam and also the steam from the auxiliary steam heater after desuperheating. Part of the condensate is used in the inter and after coolers of the air evecuators and part is used in desuperheating the steam entering the gland heater. Condensate is also used in the low-pressure seal.

Circulating water is obtained from the Desplaines River at a temperature of about 35 deg. in winter and 70 deg. to 80 deg. in summer through inclined spray-cleaned rotating screens traveling 10 ft. per minute. Circulating-pump capacity is provided to the extent of 1.67 gal. per minute per kilowatt of the attached prime mover.

The generator, which is rated at 35,300 kva., three-phase, 60 cycles, 12,000 volts, is excited by a direct-connected exciter rated at 140 kw., 250 volts, the capacity of the exciter being about 0.47 per cent of the generator capacity. Ventilating air to the extent of 80,000 cu.ft. per minute is cleaned and humidified by air-conditioning sprays. Power is stepped up for the 132,000-volt transmission line by three 12,000/132,000-volt oil-insulated water-cooled transformers (one of these transformers being a spare), and for the 33,000-volt transmission lines by two banks of 12,000/33,000-volt oil-insulated, water-cooled transformers. Two 2,000-kva., 12,000/2,300-volt, three-phase, water-cooled transformers provide station service.

Reactors are used between bus sections on the 12,000-volt bus, rated at 1,860 kva., and in the station auxiliary power transformer and 12,000-volt feeders rated at 111 kva. On the 2,000-volt side of the generators and transformers there are type FH-206 2,000-amp., 15,000-volt oil circuit breakers. In the 132,000-volt circuits three-pole, 400-amp., 145,000-volt single-throw motor-operated air-break switches are used. For circuits feeding the 2,300-volt auxiliaries 400-amp. and 800-amp., 15,000-volt type D-22 switches are employed. Varnished-cambric cable is used for circuits of 17,000 volts down to 750 volts and rubber-insulated conductors for 600 volts and lower.

Electricity Winning Its Way in India

PRESS correspondents in India assert that electricity has gained rapidly in use in that ancient land. Contracting companies are hiring electrical workers in England and placing large orders for goods with English manufacturers. Many palaces of native potentates are entirely lighted by electricity and many villages, even in the remote parts of the country, have electric street lights. A plant has recently been established at Chamba, 10,000 ft. up in the Himalayas, which supplies power to 250 villages and is entirely operated by a native staff. One ruler is said to have outlined his palace with electric lights which may be seen at night for several miles.

Benefits of Power-Factor Correction

Users of Fynn-Weichsel Motors Give Their Experience with This Equipment—Advantages by Which They Justify Expense from the Economic Viewpoint—Operating Experience Obtained and Benefits Realized

By ALLEN M. PERRY* and H. C. ANDERSON†

AMONG the various methods of improving power factor—namely, better adaptation of motors to drives, use of static condensers, synchronous condensers, synchronous and other power-factor corrective motors—the use of the Fynn-Weichsel motor is perhaps the newest. Because of its short usage not much is generally known about it. Consequently the ELECTRICAL WORLD has made an analysis of several installations to obtain the users' viewpoints. Among the plants studied have been the following: McClymont Marble Company, Milwaukee; Elizabeth Sash, Door & Supply Company, Elizabeth, N. J.; Herbrand Company, Fremont, Ohio (manufacturer of drop forgings); Ludlow-Saylor Wire Company, St. Louis (manufacturer of wire screen); American Can Company, Los Angeles; Federal Machine & Welder Company, Warren, Ohio; Trumbull Manufacturing Company, Warren, Ohio (general machine shop and foundry), and the International Shoe Company, St. Louis.

In all cases the executives, their engineers or the production managers have been approached with the emphatic explanation that both good and bad experiences were wanted. Inquiry was made into conditions which induced them to consider the Fynn-Weichsel motor, such as power-factor penalty clauses in demand rates, inefficiently utilized investment in service equipment or overloading thereof, poor voltage regulation and consequent reduction in starting and running torques and speeds of motors, copper losses due to poor power factor, effect of power factor on production quality and quantity, ability to start and carry loads, etc. The users were also questioned regarding how they justified the investment from an economic viewpoint compared with other means of power-factor correction. Experience was also elicited on some apparently questionable features of the new motor to ascertain if they really exist; for example, commutator trouble, rewinding expense, starting and pull-out torque, critical point (i.e., load at which motor changes from induction to synchronous characteristics), efficiency, adjustment of power factor, wiring costs, etc. Data on all of these subjects could not be obtained from every user approached because the occasion or opportunity to investigate them had not arisen, but, considered collectively, the experiences recounted answer many of these questions.

In many cases where power-factor penalty clauses existed demand charges were reduced considerably. Power-factor improvements as great as 55 per cent were effected, with resulting higher utilization of investment in service equipment and better operating results. Production was improved in quality and quantity. One company minimized considerably the amount of its product spoiled and increased production 10 per cent. Another company whose service facilities were already overloaded was able to add 14 per cent in motor load and avoided an expenditure of $1,800 which would have been required to change service facilities if the method adopted had not been employed. More specific details and benefits are related in the following paragraphs, which give the experiences of various users of the Fynn-Weichsel motors:

In analyzing the few troubles reported investigation showed that in most cases they arose in the control equipment and not in the motor itself. For example, the Ludlow-Saylor Wire Company traced its trouble to a defective spring in the motor starter. Upon replacing the spring no further trouble was experienced. The McClymont Marble Company burned out a starter installed on a 7.5-hp. motor driving a rubbing bed because of the severe starting duty imposed. When a heavier type of starter was substituted this trouble disappeared. At the new Herbrand plant a little difficulty was experienced which at first could not be easily explained. When the motor was shipped back to the factory and inspected, it was found that one of the connector lugs had not been properly soldered. When the lug was completely filled with solder no further trouble was experienced with the motor. This experience merely stressed the importance of rigorous factory inspection and cannot be adduced against the motor itself.

MARBLE WORKS REDUCE DEMAND CHARGE

One hundred and seventy horsepower in power-factor-correction motors has been added to the 550 hp. in squirrel-cage motors operated by the McClymont Marble Company, Milwaukee, with very satisfying results, according to J. J. McClymont, president of the company. With the squirrel-cage motors alone the average monthly power factor was about 61 per cent. During the month when the marble works began installing the power-factor-correction motors the power company changed its meters from the secondary to the primary side of the service transformers, to permit the user to receive the primary rate, advising the consumer that this change would reduce the power factor five or six points owing to the reactive current taken by the transformer. Still, during the month ended November 11, 1924, when 145 hp. of Fynn-Weichsel motors were operated in addition to the squirrel-cage motors, the average power factor was 71.6 per cent, or a gain of 15.6 points. Taking into consideration the power-factor clause in the power company's demand charge, the consumers' demand charge for the month of 71.6 power factor was $43 lower than it would have been with a power factor of 56 per cent. If the new motors had represented a larger proportion of the total load or had even been operated more continuously, the average power factor would have been even better and a greater saving in the demand charge realized. However, two of the largest motors are on the same machine and are arranged so that only one can operate at a time. Since the period

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to which the preceding remarks apply two additional power-factor-correction motors have been installed, totaling 25 hp. A list of the corrective motors installed and a brief outline of their applications are given herewith.

When asked why he considered Fynn-Weichsel motors for the purpose under notice, Mr. McClymont replied: "The Wagner Electric Corporation declared that these motors could not only serve to correct power factors but could start and carry the loads under consideration more satisfactorily than squirrel-cage or slip-ring motors of the same rating. Since the other 550 hp. in squirrel-cage motors of that company's make had performed in the way it promised, I had faith in the company's claims. Correction of power factors, because of the clause in the service rates, was the most imperative need, and if I can spend a little money to save more money, I consider it good business."

Effect on Production

"Was the quality or quantity of production obtainable with the old conditions unsatisfactory?" Mr. McClymont was asked in the presence of one of his electrical men. "For example, did the low power factor cause excessive reduction in motor voltage, thereby reducing the motor torques and speeds, making them inadequate for the duties they had to perform and cutting down production? By the way, the torque of a motor is proportional to the square of the voltage and a slight reduction would greatly reduce the torque."

"Fortunately for us," he replied, "the Milwaukee Electric Railway & Light Company maintains very good voltage regulation and our plant distribution lines are short, so we have not suffered reduction in motor voltages so far as we have noticed. However, we have found by comparison with the recent motor installations that the speed of the squirrel-cage motors when heavily loaded during starting or running is considerably reduced."

Better Utilization of Investment

"Has the poor power factor so loaded up your transformers, distribution system, switches, fuses, meters and so forth with wattless current that you would have been forced to increase your service facilities to carry additional load if the power factor had not been improved?" was the next question.

"No," Mr. McClymont returned, "all of our service facilities are laid out for a larger load than we have, and we have not experienced this handicap, although we might with the circuits loaded to their estimated capacity. At such time I can readily see the increased advantage of improved power factor in warding off the day for increasing circuit sizes and assuring ourselves of the maximum utilization of our investment therein."

"What about the losses in circuits at power factor that you have experienced, Mr. McClymont?"

"We have not measured them," he replied, "although I understand that 50 per cent power factor requires double the current necessary for carrying the load and that would quadruple the losses over unity power factors."

Large Starting Torque Obtained

"Aside from the reduction in your demand charge, what benefits have you derived from the installation of the power-factor-correction motors?" was a question that brought forth some interesting facts.

"Let's take a look at some of the applications and I can point out," Mr. Clymont said, leading to the marble-rubbing beds in the plant. "We use 7.5-hp. Fynn-Weichsel motors (installed September 1) to drive each of these rubbing beds [indicating two]. They weigh 18,000 lb. apiece and require about three times the power to start that they do to keep them running, but the motors have a large starting torque, although they operate at synchronous speed up to excessive overloads. On the other rubbing beds we use 10 hp. or 15 hp. squirrel-cage motors and would hardly dare use less than 10 hp. These new installations require only one to one and a half minutes to bring them up to speed from standstill [indicating by demonstration]. By treading we can start them in thirty to forty-five seconds. Some idea of their inertia is indicated by the fact that they take twenty to thirty minutes to stop after power has been disconnected. They require about 6 hp. to keep them running. Obviously, a 7½-hp. motor carrying 6-hp. load is operating under much better conditions, not only of power-factor but of mechanical efficiency, than a 10-hp. or 15-hp. motor on the same load."

TABLE I—170 HP. IN FYNN-WEICHSEL MOTORS IN McCLYMONT MARBLE WORKS

(All motors three-phase, 220-volt.)

No.	Hp.	Application
1	75	Four carborundum cutters
1	30	One carborundum cutter
1	25	Compressor
1	15	Two gang saws
2	7.5	Rubbing beds
1	10	Sand pump

Proceeding to the gang saws, he pointed to two which were cutting marble, driven by one 15-hp. motor which had been installed November 1. "That motor is doing the work satisfactorily," he said, "whereas one 40-hp. squirrel-cage motor is required to drive those three gang saws and two sand pumps. The latter require about 14 hp. to 16 hp. We have two gang saws operated separately by one 10-hp. and one 15-hp. squirrel-cage motor respectively. All of these saws will require about two and one-half times the power to start them that they do when running. They will accommodate up to eighty-four blades apiece and run eight to ten days continuously. On test one gang saw with forty to fifty blades took 6.4 hp. running, and two others driven by one motor required 15 hp. The power is affected by the number of blades used, the texture of the marble and the rate of feed."

Nearby was an air compressor which runs twenty-four hours a day. According to the manufacturers' recommendations, it requires 31 hp. The compressor is driven by one 25-hp. motor (installed October 1) through a belt with an idler pulley, continually com-

TABLE II—EFFECT OF IMPROVED POWER FACTOR ON DEMAND CHARGE OF MARBLE WORKS

Billing Data for Month Ended August 11, 1924	
Consumption, kw.-hr.	64,684
Reactive kva.-hours	81,600
Measured demand, kw.	182.4
Average power factor (based on kw.-hr. and reactive kva.-hr.) per cent	61
Standard power factor, per cent	80
Billed demand (corrected for power factor) kw	246.4
Demand charge (based on sliding scale)	$249.80
Demand charge per kw.-hr. used (cents)	0.386
Total bill	$965.54
Total bill per kw.-hr. used (cents)	1.49
Billing Data for Month Ending November 11, 1924	
Consumption, kw.-hr.	73,440
Reactive kva.-hours	71,520
Measured demand, kw.	184.3
Average power factor, per cent	71.6
Standard power factor, per cent	80.0
Billed demand (corrected for power factor), kw.	205.9
Demand charge	$219.43
Demand charge per kw.-hr. used (cents)	0.299
Total bill	$1,045.70
Total bill per kw.-hr. used (cents)	1.425

pensating for poor power factor caused by squirrel-cage motors operating at less than full load.

The carborundum cutters, which are mounted on a frame over a sliding table looking like a planer bed, are driven by power-factor-correction motors. Four cutters mounted on one shaft and driven by a 75-hp. motor are used for the longitudinal cutting and a single carborundum wheel driven by a 30-hp. motor for transverse cutting. These were newly motorized August 1. Longitudinal feeding is accomplished by special feeder motors, relays being installed so that if a carborundum-wheel motor stops, the feed will stop, preventing mutilation of the marble and destruction of cutters.

"According to test," explained Mr. Clymont, "these motors have been tested up to excessive overloads. One big advantage is that their speed does not drop with overload, owing to the synchronous characteristic being nearly double the normal rating. The actual running load varies from 15 hp. to 80 hp., depending on the work being done; still the motors are always compensating for the poor power factor of the squirrel-cage motors. At present, we cannot feed the carborundum wheel as high as the motors will stand because the carborundum wheels become glazed if they run through soft marble. When the obstacle is overcome, we can take full advantage of the capacity of the motors and speed up production."

Returning to Mr. McClymont's office, his interviewers asked for his experience with the motors, asking particularly about commutator trouble, ease of rewinding, starting and pull-out torque, critical point (where motor automatically changes from synchronous to slip-ring characteristics), efficiency, adjustment of power factor and so forth. He replied that his electrician had experienced no commutator trouble, the commutator voltage being only about 18 volts. No experience had been had in rewinding, but the Wagner corporation declares that complete rewinding of a Fynn-Weichsel motor costs only 10 per cent more than a slip-ring motor of same rating; that the cost of rewinding the rotors is approximately the same for the two types, whereas the stator of the Fynn-Weichsel motor costs about the same to rewind as the rotor. Depending on whether the motor is small or large, the starting torque ranges from 250 to 300 per cent and the critical torque from 150 to 200 per cent. The pull-out torque is about 300 per cent. The tested efficiency of the motors installed in these plants is shown in the accompanying curves. While the ability of the motors to correct power factors can be adjusted by shifting the brush holders, the manufac-

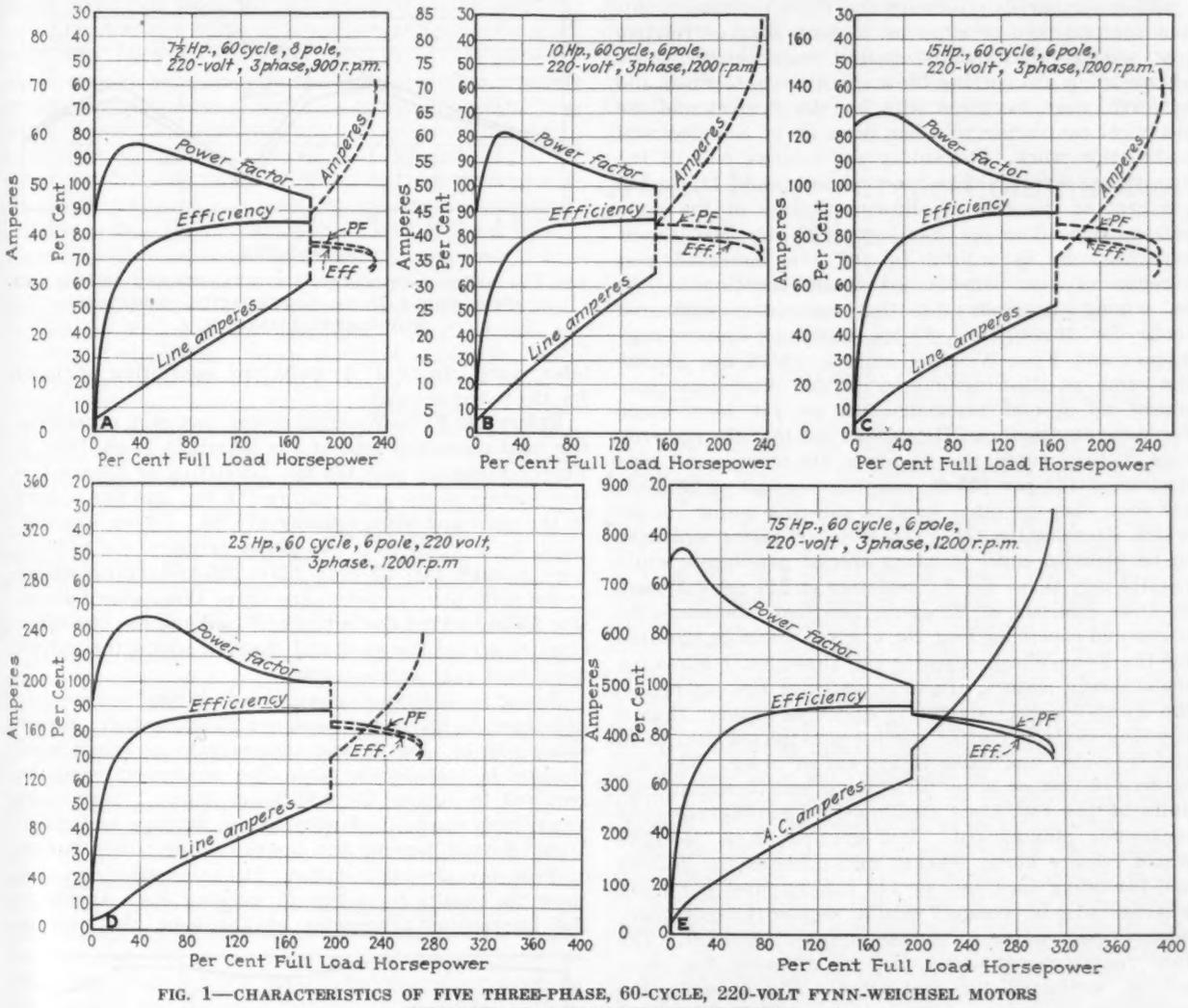

7½ Hp., 60 cycle, 8 pole, 220-volt, 3 phase, 900 r.p.m.
10 Hp., 60 cycle, 6 pole, 220-volt, 3 phase, 1200 r.p.m.
15 Hp., 60 cycle, 6 pole, 220-volt, 3 phase, 1200 r.p.m.
25 Hp., 60 cycle, 6 pole, 220 volt, 3 phase, 1200 r.p.m.
75 Hp., 60 cycle, 6 pole, 220-volt, 3 phase, 1200 r.p.m.
Power factor
Efficiency
Amperes
PF
Eff.
Line amperes
A.C. amperes
Amperes
Per Cent
Per Cent Full Load Horsepower
A
B
C
D
E

FIG. 1—CHARACTERISTICS OF FIVE THREE-PHASE, 60-CYCLE, 220-VOLT FYNN-WEICHSEL MOTORS INSTALLED AT McCLYMONT MARBLE WORKS

A, 7.5 hp., 900 r.p.m.; B, 10 hp.; C, 15 hp.; D, 25 hp.; E, 75 hp. B, C, D and E are 1,200-r.p.m. motors.

turer prefers to set them for a given correction itself. Developing the excitation current within itself, the Fynn-Weichsel motor does not need an outside source of direct current for synchronous operation. By properly proportioning the number of squirrel-cage and Fynn-Weichsel motors near each other, it is possible to compensate for the wattless current practically at its source, thereby not only improving the power factor of the whole installation but all circuits as well.

ECONOMIES IN CIRCUIT EXPENSE

Other comparisons between the Fynn-Weichsel motor and squirrel-cage or slip-ring motors, such as relative cost, wiring requirements, conduit requirements, labor of threading and cutting the conduits, size of fuses and so forth, were discussed with Mr. McClymont and the electrical contractor who has done all of his electrical installation work. Regarding the relative cost of the motors, the Fynn-Weichsel motor costs about 116 to 142 per cent of the cost of slip-ring motors of the same rating, depending on the rating. Mr. McClymont says that he is willing to pay the increased cost because of the benefits previously mentioned. As to wiring requirements, the contractor compared those for three-phase, 75-hp., 220-volt squirrel-cage motors and Fynn-Weichsel motors, which are classed the same as slip-ring motors in the Wisconsin code, where no special provision has as yet been made for these new motors. He pointed out that the squirrel-cage motors would require three 300,000-circ.mil conductors at $31 per 100 ft. and 3-in. conduit at 58 cents per foot. On the other hand, a slip-ring motor (under which classification the Fynn-Weichsel motor will have to be included until it has a special privilege) would require only three No. 0 conductors at $17 per 100 feet, in 2-in. conduits at 29 cents per foot. Between the motor and controller four No. 6 wires would be required for the Fynn-Weichsel motor and three No. 1 wires for the slip-ring motors. In the opinion of the contractor, the Fynn-Weichsel starter is easier to connect than a slip-ring controller after one becomes accustomed to it, and it is also less liable to get out of order. The difference in cost of labor for cutting and threading conduits of the two sizes mentioned is considerable, the contractor pointed out. For example, 3-in. conduits would require about seventy man-minutes for cutting and threading each end, or 140 man-minutes per joint, whereas a 2-in. conduit would require twenty man-minutes per end or forty man-minutes per joint. The fuse requirements would also be different for these motors, explained the contractor. For example, the squirrel-cage motor of the rating mentioned would require 360-amp. starting fuses and 225-amp. running fuses, whereas the slip-ring motors (under which, once again, the Fynn-Weichsel motor will have to be classed until special provision is made for it) would only require running fuses rated at 240 amp.

Rather than install larger service transformers and completely rewire the plant for a larger load, the Elizabeth Sash, Door & Supply Company, Elizabeth, N. J., met all requirements by installing a Fynn-Weichsel motor to improve the very low power factor and at the same time carry an additional 25-hp. load. The motor is reported to be operating satisfactorily in every way, and it is reducing power bills below what they would be with an ordinary induction motor load by decreasing the I^2R losses. It is doing this under adverse voltage conditions which reduce the leading current and increase the lagging current of the induction motors. The tendency of the motor, however, to maintain voltage further reduces the losses under what they would be if induction motors were used. Since the installation of the Fynn-Weichsel motors the power factor has been raised thirty-two points. These and other advantages, which will be related more in detail later, were told by J. A. Balmford, consulting engineer for the power company.

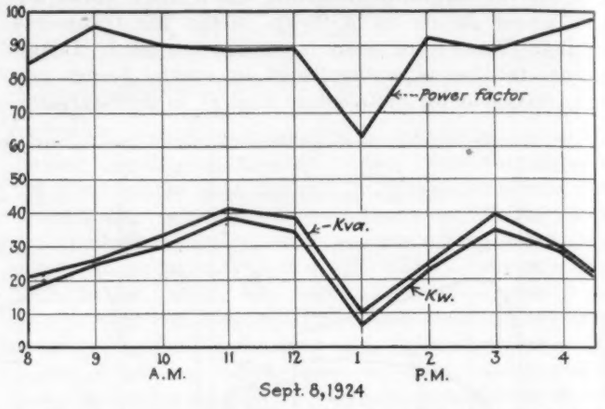


FIG. 2 — POWER FACTOR, KW. AND KVA. DEMAND BEFORE AND AFTER ADDING 25-HP. POWER-FACTOR-CORRECTION MOTOR AT ELIZABETH, N. J.

Before the Fynn-Weichsel motor was even considered the total connected load of the Elizabeth Sash, Door & Supply Company was 176 hp., consisting of nine induction motors in the mill totaling 156 hp., and five motors in the yard and shop, totaling 87½ hp. Power was supplied by a 2,300-volt, two-phase primary distribution line through two 25-kva., 2,300/220-volt transformers (outside the plant on poles) and three three-wire feeders. One feeder served the entire mill load and the two other circuits served the yard and shop, in which the motors were used very infrequently.

Owing to additional power needs it was proposed to add three 7½-hp. motors and one 25-hp. motor. Before this could be done it was necessary to ascertain what changes in transformer and other equipment would be required to supply the additional power. Tests were accordingly made to determine the average and maximum kilowatt demand and corresponding power factors of the motors already installed. The accompanying curves show the results for a typical working day. Owing to the intermittent character of the load, the average demand was only 10 kw. with a maximum of 20 kw. and the power factor around 58 per cent. As may be observed, the average demand dropped as low as 5 kw. The demand in kva. ranged between 9 and 35.

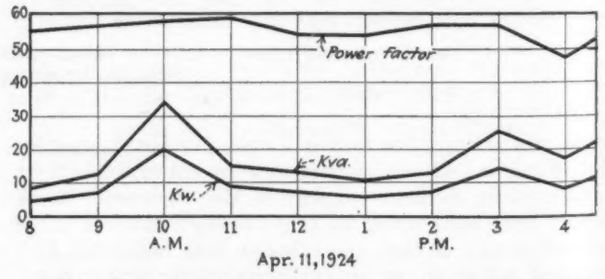


FIG. 3—25-HP. POWER-FACTOR-CORRECTION MOTOR DRIVING BLOWER CONTINUOUSLY AT ELIZABETH, N. J.

The new 25-hp. motor contemplated was to drive an exhaust fan and would operate at a fairly constant load almost continuously. If an induction motor were used

for this service, it was estimated that an average total load of about 45 kva. would be required by the mill and larger transformers would have to be installed. These could not be mounted on the pole, which was already occupied by transformers, but would have to be housed in a vault on the customer's premises and at his own expense. Owing to local conditions, this vault would have to be situated in the rear of the premises at a considerable distance from the original service panel, making it necessary to revamp the entire wiring of the plant. Moreover, the city inspector would not allow a 25-hp. induction motor to be connected to the existing mill circuit as the wires were quite warm with the load they were already carrying. To make the change would require the expenditure of about $1,800, besides complete interruption of service. It was suggested that if the power factor on the mill circuit were improved to 90 per cent or better, the kva. demand might be reduced sufficiently to enable existing transformers and distribution lines to supply the increased power required.

Consequently, it was decided to install a 25-hp. Fynn-Weichsel motor to drive the exhaust fan instead of the induction motor first contemplated. This application was chosen because it is expected that this motor will be running whenever the plant is in operation and the motor will therefore always supply the required corrective kva. Furthermore, this motor was to be connected to the mill feeder, thus providing means of correcting the low power factor near the source of the trouble. The power-factor-correction motor was chosen in preference to an ordinary synchronous motor because of its better starting characteristics, because it will carry large overloads without falling out of step and because it will carry normal loads under low-voltage conditions and does not require special or skilled attendance.

Effect on Power Factor, Demand and Losses

After the Fynn-Weichsel motor was in operation tests similar to those made before its installation were made to determine the power and power factor on the feeder. Additional tests were made with indicating instruments to determine the power, power factor and voltage conditions at the Fynn-Weichsel motor. Results are shown in the accompanying curve.

As may be observed, the kilowatt demand now averages 27 kw. and the kilovolt-ampere demand 29 kva., while the average power factor is over 90 per cent. The curves are plotted from the hourly average of five-minute readings. It may be noted that on the date of the test the Fynn-Weichsel motor was shut down between 12:30 p.m. and 1 p.m., with a corresponding drop in power and power factor at this time. The power-factor-correction motor itself showed an average power consumption of about 17 kw. at 235 volts with a leading power factor of 96.5 per cent. The total mill demand of 27 kw. less 17 kw. for the power-factor-correction motor leaves an average of 10 kw. for the mill, which indicates similar operating conditions to those obtained during the first test. However, the power factor has been improved from 58 per cent to 90 per cent, and the average kva. demand increased only 76.5 per cent with an increase of 170 per cent in the kw. demand. The power factor of 96.5 per cent of the Fynn-Weichsel motor is nearer unity than was expected, owing probably to the high voltage at the machine, which was adjusted for 220-volt operation. This results in less correction than was anticipated, but even so the installation is very satisfactory.

In addition to saving the cost of installing new transformers and wiring, the new motor has apparently reduced the power bills below what they would have been had an induction motor taken its place by reducing the I^2R loss in the line on account of the improved power factor. Based on the average kva. readings and resistance of the mill feeder, the power loss is 28.55 kw.-hr. per day, according to Mr. Balmford. With full-load power factor of 85 per cent, the line loss with an induction motor in place of the power-factor-correction motor would increase the line loss to 45.25 kw.-hr. per day, or 16.7 kw.-hr. more. Of course, these calculations only give the approximate losses, which should have been determined from a kva.^{2} curve instead of an average kva. curve. However, since the shape of the curve in both instances would be quite similar, it is apparent that the saving in losses is quite a considerable item.

Home Rule Versus Commission Regulation

Central Indiana Power Subsidiaries Explain Fallacy of Former Applied to Utilities Operating in More than One Territory

By Lucius B. Andrus
President Central Indiana Power Company Subsidiaries, Indianapolis

ACTIVITY has been manifested in certain localities in the advocacy of home rule, and this includes bringing the rates and service of utilities under the control of the local or regional governments. Such a procedure might under the old order of doing business, where each municipality was served from its individual power plant, be justified, at least to the satisfaction of the advocates of home rule. Those who have intimately interested themselves in the development of the light and power industry during the last few years know, however, that home rule would become a boomerang to the very persons who advocate it. I have been asked by utility executives how the objections to home rule have been explained to the public by this company's subsidiaries, and it is possible that other companies would appreciate the same information.

Superpower is a definite engineering development which makes its appeal on a sound economic basis. There is nothing rigid and inflexible in the superpower program, nothing a knowledge of which needs to be carried to every out-of-the-way corner of the country before its value can be felt. It is a working schedule. In fact, it is already at work. Superpower systems have passed from the stage of discussion to the stage of realization. The era of superpower development is characterized not only by great technical achievements, but also by the establishment of a new order of relationship within the industry. Municipal boundaries and county lines have no meaning to the superpower system. The result is that utilities, to reach their objective, must now have a settled public policy uniformly applicable and adapted for the purpose of promoting the general public interest. To the utility viewpoint of municipal boundaries or county lines new meaning must be given. Superpower electrification is quite distinct from the building of a number of local power plants. It is the planning of an electric power system that will use the natural power resources to the best advantage. The network of power lines forms a vast reservoir into which many generators pour their

energy and from which electric power will be distributed in the most economical manner to the greatest number of users.

Although distinct advantages have accrued from the generation of electrical energy in large power plants through their centralization and interconnection, some problems of regulation have been presented for solution as a result of the superpower developments. These problems cannot be decided by any local or regional tribunal. There must be a positive program around which all may rally who are honestly seeking general development in the public interest rather than promoting individual interests which lie within municipal boundaries only. The realization of such a program, in the light of many changes in the methods of supply, character of the business and establishment of a new order of relationships, lies wholly in the right of the state to regulate throughout the unit of territory served. Furthermore, it is the right of the state to intervene in electric matters that concern the general welfare of this area considered as a whole.

Enactment of the utilities regulation law was necessary to correct discriminations of various and serious kinds which had grown up in many localities where the utilities were wholly under the control of the local governments. In so legislating the state merely repossessed itself of a power of regulation which it had always had.

CHANGE IN CONDITIONS

Changed conditions have been constantly developing as the electrical business has progressed. The economies of central-station development, which close down the individual steam plant in every locality, have operated to bring about more economical production in large plants or systems furnishing energy to many towns, cities and rural districts. Should each such city or other local governmental body seek to fix its own electric rates and thereby attempt to pass the burden on to other towns and cities, or should there be no co-ordination in the distribution of the burden of the total cost of performing all the service in a fair and reasonable manner to the various communities served, a chaotic condition would result. The same principles extend to a degree to many gas operations and telephone enterprises throughout the state as well as to other forms of public service.

If occasions requiring that the state repossess itself of its inherent power had not arisen prior to this time, then the superpower system of electric supply would now make it the duty of the state to exercise its power to intervene in matters which concern the general welfare.

Inasmuch as the basis for the generation and transmission of electricity has passed far beyond the municipal boundary, ideas concerning the business of electric supply must now conform to the fundamental economics of the new situation formed by the superpower system of electric supply. In this a logical unit of territory is treated as a unit, regardless of whether it occupies one township or a dozen counties within a single state. It is considered as a complete whole and it is developed on that basis—the one essential, logical basis. Therefore the recent progress of the electric business would have forced state-wide control of supervision even had the state failed prior thereto to accept the responsibility through setting up a regulating commission.

The foregoing considerations demonstrate the necessity for the state's supervision of public utilities which were once merely subjects of local concern but which have grown, developed and extended their activities until they vitally affect the people at large in a given area whatever its size. An attempt to eliminate state-wide control and to return to local and partial control of institutions now state-wide in scope would soon demonstrate the necessity of a state commission. It might be necessary to pass through a period of strife and litigation, expensive alike to the public and the business affected, but in the end the state would of necessity repossess itself of the power of regulation.

Letters from Our Readers

Sees Need for More Definite Recommendations for Lighting the Home

To the Editor of the ELECTRICAL WORLD:

I was very much interested in the editorial "Watts per Square Foot in Residence Lighting" in the October 25 issue of the ELECTRICAL WORLD. The editorial refers to dining-room lighting.

It seems to the writer that to continue to do as we have in the past will make the general acceptance of adequate lighting equipment much slower, and in many cases it will be impossible to get our message across to the public unless we are able to make more definite recommendations for lighting equipment in the home.

I have before me the small booklet prepared by the National Lamp Company containing "Home Lighting Recipes," and I have also just referred to pages in a booklet, "Equipping Your Home Electrically," which we have been distributing for the past three years. In one place the prospective purchaser is definitely advised that a 75-watt lamp will give satisfactory light in a dining room, while if a four-light candle fixture or a four-light direct-lighting unit is used, then the recommendation calls for 200 watts.

The "Home Lighting Recipe" is written under the head of "Flood the Table with Light," and according to the illustration, this is to be accomplished by a four-socket candle fixture. It seems to me that the heading must have been written while the writer was thinking of an "Ivadine" or a similar unit, and if he had experimented with a candle fixture of the type shown, he would have been convinced that the light is almost as intense on a horizontal line as it is directly beneath the lighting fixture.

After checking over "Home Lighting Recipes" and other recommendations which have been made by illuminating engineers, it would seem safe to make a definite recommendation of not less than one watt per square foot, which compares very favorably with the maximum recommendations in the "Home Lighting Recipes."

I am of the opinion that it will take considerably less time and that the result will be equally good, if not more satisfactory, if we adopt the following simple formula for general illumination in the home: Total square feet divided by number of sockets in ceiling fixture equals wattage of lamps that should be used in ceiling fixture. For example, a room with 200 sq.ft. with four sockets would require four 50-watt lamps, and if there were only one socket, it would require one 200-watt lamp, and if a fixture should happen to have three sockets, then the purchaser would be in-

structed to purchase standard lamps with the wattage rating nearest to the result obtained by dividing the number of sockets into the total number of square feet.

This may not be exactly the correct answer to the problem, but I think that we should make more definite recommendations and be more generally agreed on matters of this kind. The same thing applies to wiring, and if we would all make a definite recommendation of at least three convenience outlets in each active room in the home, it would not require so much time to impress upon the owner or tenant the necessity for this number.

JACK NORTH,
President Electrical League of Cleveland.
Cleveland, Ohio.

Causes of Breakdown of Dielectrics

To the Editor of the ELECTRICAL WORLD:

Your editorial on the pyro-electric theory of insulation in the December 20 issue of the ELECTRICAL WORLD is both interesting and of value to all who are trying to explain the nature of breakdown of dielectrics. Explanations along lines of heating, moisture content, gaseous absorption, etc., are of interest, but I doubt if they ever will explain what occurs. The effects from the above lines of reasoning are physical rather than purely electrical. Naturally, they will influence breakdown, but when we try to make the apparent resulting law general we find that it is limited in its application and therefore its value is decreased. The work of Rogowski and Karman, as reported in your editorial, brings this out very well for heating. If heating has an influence, then thin insulation should have a higher breakdown voltage than heavy insulation owing to the greater radiation. However, the breakdown voltage for thin insulation cannot be entirely explained on heating. Moisture content influences breakdown very materially for small quantities, the breakdown voltage finally reaching values where increasing quantities of moisture do not have great influence. This, again, is physical.

The work of Wagner deals with physical effects from electrical. When considered on a time-functioning basis, it is hard to conceive of heat having much influence on a very short time test. Breakdown occurs, due either to mechanical defects or purely electrical causes. Eliminating mechanical defects, what possible electrical phenomenon can cause breakdown? Leakage resistance causes heating, still physical. Voltage stress seems to be the logical thing to consider. This is a distinctly electrical matter pertaining to the insulation. Of late there has been a tendency to disregard voltage stress and to assert that there is no such thing. This is hard to believe. We refer in the properties of materials to unit weights, tensile strength, coefficients of expansion, resistivity or conductivity; what is wrong in believing there is a unit of voltage breakdown? It has been established that gases have definite voltage breakdowns, dependent on temperature and pressure. Why not conceive of oils and solids having definite voltage breakdowns? The action of gases has been pretty well explained by the law of corona, which is only another way of saying ionization. What is there to prevent oils and solids from acting in a similar manner? It is only a question of degree of ionization. In one case we are able to see visually what takes place, but that does not prevent it occurring in opaque materials. The writer believes the ideas advanced by him in an article in the *Transactions of the A. I. E. E.*, Vol. 42 (1923), page 1, are worth considering as a basis for study. They are an elaboration of the corona law for gases. If some of our physicists would take up the problem along the lines suggested, it is believed a step along the desired road would be taken.

ROBERT J. WISEMAN,
Research Engineer.
Okonite Company,
Passaic, N. J.

Mathematical Proficiency Versus Mechanical Experience

To the Editor of the ELECTRICAL WORLD:

On page 1208 of the ELECTRICAL WORLD for December 6 there is a letter by Wood Wilson on the above subject the final sentence of which reads: "The fan will last as long as it is lubricated, but the cord must fail after a few seasons." There is no question about the failure of the cord. On the other hand, when I bought a fan of standard make the authorized dealer informed me that the manufacturer would not guarantee it more than one year because some users insist on storing their fans in a damp place when the hot weather is over and as a consequence punctured insulation results in spite of impregnated windings.

It seems to me that the final sentence I have quoted is a fair characterization of the entire letter—that is, a part of it is true and a part is at least short-sighted. As I look at it, the essential trouble is that our technical schools are failing to turn out graduates who are equal to the former graduates who have had five or ten years of actual practice. I wonder if Mr. Wilson would care to make a constructive suggestion in this matter.

I have known of cases, if my memory is not incorrect, in which manufacturers purposely have made certain parts inaccessible and certain connections inconvenient for the purpose of compelling the user to take the apparatus to a repairman whenever a change is needed. This was on the assumption that any electrician, no matter how bad, presumably was better qualified to make repairs than the average consumer. Further, he is almost certain to have shop equipment or tools which a great many consumers never heard of. Besides this, for instance, a fan which has been in service long enough to require a new cord is likely to be benefited by thorough overhauling, and a good repairman will not accept a detail repair without going over the entire apparatus, at least in a superficial manner and often in a thorough manner. How much of this attitude on the part of the manufacturer is responsible for the situation to which Mr. Wilson objects is a thing I cannot answer. Possibly the engineer who is responsible will care to comment. However, this point is secondary to the point in the previous paragraph, and I hope that no one will concentrate on this to the exclusion of proper consideration of the educational question, which has been so violently agitated for some time.

Incidentally I think the consumer has something to learn. I have done repair work on apparatus installed in a place so inaccessible that if my arms had been one-eighth of an inch shorter, I should have been compelled to push out a concrete building wall in order to get close enough to the trouble to fix it. I wonder if any one has any constructive suggestions on the consumer's end of the bad practices which still exist to some extent?

H. H. KETCHAM.
Honolulu Iron Works Company,
New York, N. Y.

Central Station and Industrial Practice

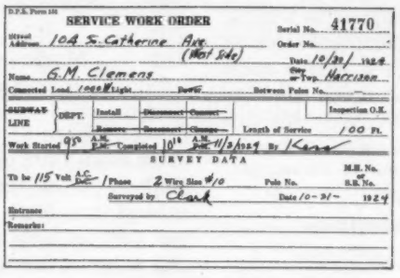
Routing Service Calls and Checking Performance

BY GODFREY A. DOELLER
Dayton (Ohio) Power & Light Company

TO ENABLE its service crews to handle calls most quickly and with the least truck-hours and man-hours between stops, the Dayton Power & Light Company divides its territory into sections, requiring the service crew to cover one-half the territory in the morning and the other half in the afternoon. Since the service crews know the road conditions better than the inside force, they are required immediately after receiving service orders to route the calls so that the least time will be consumed between stops. A typical form on which the service orders are made is illustrated.

The data recorded on the service work order by the service crew foremen are used by the supervisor of the service crews to study and check up on the density of work, the performance of the service crews as to routing, miles per call and compliance with orders. From each service crew's daily report a paper tracing is made over a small-scale map of Dayton (one inch equals 3½ miles) showing by symbols the services run and removed, floor planer boxes installed and removed, service not ready, locations where service men could not enter the house, etc. The air-line route from place to place is located by lines connecting the service locations. A two-color scheme is used to distinguish the morning and afternoon routes. A summary of the work performed, analysis of calls per mile and percentage of incomplete calls to total calls are also indicated.

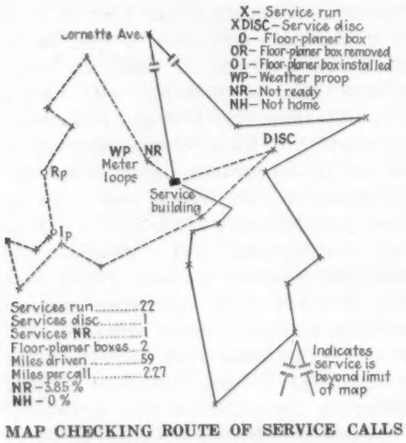
A recent study of maps showed that the morning (west side) route involved more calls than the east side route. By a rearrangement of boundary lines this inequality of work has been minimized. These records have also given a basis for controlling the routing. On a specific map, illustrated herewith, the "disconnect" in the east section should have been performed with the other work on the east side, thereby saving several miles of extra driving.


SERVICE WORK ORDER

Serial No. 41770
Street Address 104 S. Catherine Ave. (West Side)
Order No.
Date 10/20/1924
Name G. M. Clemens
Dist. or Sup. Harrison
Connected Load 1000 W Light Power Between Poles No.
STREET LINE DEPT. Install Disconnect Change Inspection O.K.
Remove Reconnect Change Length of Service 100 Ft.
Work Started 9:50 A.M. P.M. Completed 10:15 A.M. P.M. 11/5/1924 By Kane
SURVEY DATA
To be 115 Volt A.C. D.C. / Phase 2 Wire Size #10 Pole No. M.H. No. S.H. No.
Surveyed by Clark Date 10-31- 1924
Entrance
Remarks:

SERVICE WORK ORDER USED BY DAYTON COMPANY

In addition to the location of the service calls, the work order indicates the size of the connected load, whether it is light or power, the department to handle the work, the nature of the work, the length of the service, the time the work was started and completed, the date, the service crew foreman, the nature of the service, the size of wire, etc.



MAP CHECKING ROUTE OF SERVICE CALLS

The lines indicate the air-line routes between stops. Symbols indicate the purpose of the service calls or whether the customer was ready or not at home. An analysis is given at the bottom of the map, indicating the number of services run, the number disconnected, the number not ready, the number of floor planer boxes installed, number of miles driven, the number of miles traveled per call, the percentage of total calls not ready for attention and the percentage not at home.

Progress of Air Preheating

Four Types Discussed Are Plate, Flue, Corrugated Rotary and Steam —These Are Found to Operate to Best Advantage with Stoker Installations

A SUBJECT which is considered very important by operating engineers, namely, air preheating, was discussed at the recent meeting of the American Society of Mechanical Engineers, Chicago Section.

Preheating of furnace air dates back as far as 1829, declared C. W. E. Clarke, mechanical engineer of Dwight P. Robinson & Company, but its application to utility boiler furnaces is especially new in the last six years. Four principal types are employed at present—(1) plate; (2) flue, both counterflow and (generally) with three passes; (3) corrugated rotary type, passing successively through the flue gas and air duct; (4) steam type, bleeding from three or four stages of the prime mover. With Eastern coals very little trouble has been experienced with the preheaters fouling because of the gas, velocity and erosive action of the cinders.

However, to avoid accumulation of deposits, the plate type should be placed in the vertical position, Mr. Clarke maintained. Results of experience with preheaters have indicated an increase of 5½ per cent in furnace efficiency due to the heat input and an additional 1½ per cent due to reduction of ash-pit losses. In Mr. Clarke's opinion, preheaters are best with stoker installations, because these increase the slagging and wall erosion with powdered-fuel combustion. To reduce wall erosion water-cooled walls are necessary. The amount of preheating desirable has not been studied sufficiently, Mr. Clarke contended, although data were given by the speaker on experiences with several installations, including the Colfax station of the Duquesne Light Company.

The subject aroused considerable discussion. In written notes W. R. Wood cited the dimensions of some compound air preheaters and the results obtained with them. In a similar manner H. Kreisinger expressed the belief that the upkeep of air preheaters will be less than that of economizers, but differed with the contention which has been raised that preheaters will shorten the flame length in powdered-fuel furnaces and consequently reduce the furnace volume required.

R. J. S. Pigott expressed the opinion that it is possible to obtain as great efficiency with air preheaters as with economizers and also cited some of the advantages of low-

pressure heat-transfer equipment, such as lower maintenance expense. Steam preheating complicates station operation, he said. Defending ventilated furnace walls, he declared that it is just as easy to utilize this construction for preheating air as to do the preheating elsewhere. He also advocated water screens to reduce furnace-wall erosion and suggested that economies can be effected by bleeding steam above 360 deg. F.

W. E. Caldwell referred to field experimentation by the United Electric Light & Power Company in studying combustion practices, referring particularly to the use of fin-type water screens at Hell Gate and the placing of forced-draft fans on the cold-air side of preheaters. C. M. Hardin expressed the opinion that the capital cost is higher with economizers and steam preheating than with air preheaters. Air preheaters will cut down stack losses, which, together with losses in the circulating water, constitute the biggest in large power generating stations, declared A. D. Bailey. Despite the fact that air preheaters used by the Commonwealth Edison Company add only 80 deg. to the temperature of the input air, there has been a marked improvement in operation. With Illinois coal containing 4 to 5 per cent sulphur and giving off a tarry deposit, air preheaters and economizers are corroded and coated, making their maintenance high.

F. Hodgkinson pointed out that economy depends on more than the turbine water rates. In his opinion, the flue-gas temperature can be reduced more with preheaters than with economizers. L. W. Heller remarked that Pittsburgh coal produces a sooty deposit like blistered paint in air preheaters and economizers, but there is no serious drop in heat transfer due to this.

In commenting on the discussion, Mr. Clarke said that time will tell whether the flame length in powdered-fuel furnaces can be reduced by air preheaters. He did not agree with the suggestion that house turbines should be bled instead of the prime movers. Commenting on the use of auxiliaries with air preheaters, he maintained that the additional expense is negligible as indicated by the fact that the forced draft had to be 11 in. in one case as compared with 7 in. without the preheater. Some real difficulties are experienced with Illinois coal, but air preheaters can be allowed to erode and corrode to paper thickness; even then the maintenance expense will be lower than with economizers. In his opinion, the air preheater will do the most for the money. In a Western station, where the cost of oil increased from 60 cents to $1.25 or $1.50 per barrel, the lowest plant cost is obtained with air preheaters increasing the input air to 300 deg. and reducing the flue-gas temperature to 350 deg.

Machine for Boring Holes in Solid Rock

BORING holes through solid rock while building a transmission line through stony country has been successfully performed by the Union Gas & Electric Company, Cincinnati, through the use of the earth-boring machine illustrated in Fig. 1. The boring machine, built by the Four-Wheel Drive Company, Clintonville, Wis., has very successfully met the new application of boring solid rock, despite the fact that its previous use had been only for digging dirt holes. In one instance where the rock was 11 ft. deep the hole was drilled in two and one-half hours. Such a hole drilled by hand methods would have required three men about four days.

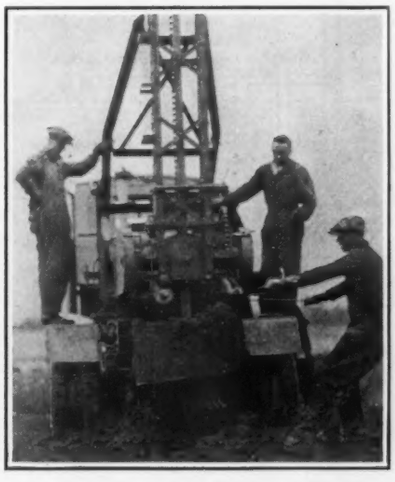


FIG. 1—BORING MACHINE WITH THE 48-IN. AUGER IN PLACE

In digging the holes for the steel-tower abutments many different sizes of augers are used. First, a 48-in. auger is placed in action to bring the level of each corner to the same plane. Because of the hilly nature of the country this work sometimes requires considerable digging with this size of auger. Then a 24-in. hole is dug about 3 ft. deep at the bottom of the 48-in. hole. This is later filled with concrete when the corner post has been set. Below the 24-in. hole another 8-in. hole is dug 11 ft. deep at an angle of 9 deg. from the perpendicular.

In digging this 8-in. hole a layer of rock varying in thickness, extending to about 1 ft. of the bottom of the hole, or 11 ft., is very frequently encountered. In these instances the first operation in boring the 8-in. hole is to drill a $1\frac{3}{4}$-in. hole through the rock to the required depth. A $1\frac{3}{4}$-in. drill is attached to the auger shaft, and the hole is drilled through the solid rock at a rate of a foot in ten minutes. After this hole is dug out it is shot with dynamite and then cleaned with an 8-in. auger.

The holes for the corner posts are drilled at an angle of 9 deg. from the perpendicular in order to obtain greater security against the tipping over of towers. It is necessary that the degree of slant shall not vary more than 1 in. In order to insure this exactness, the boring machine is leveled by instruments and the "drill

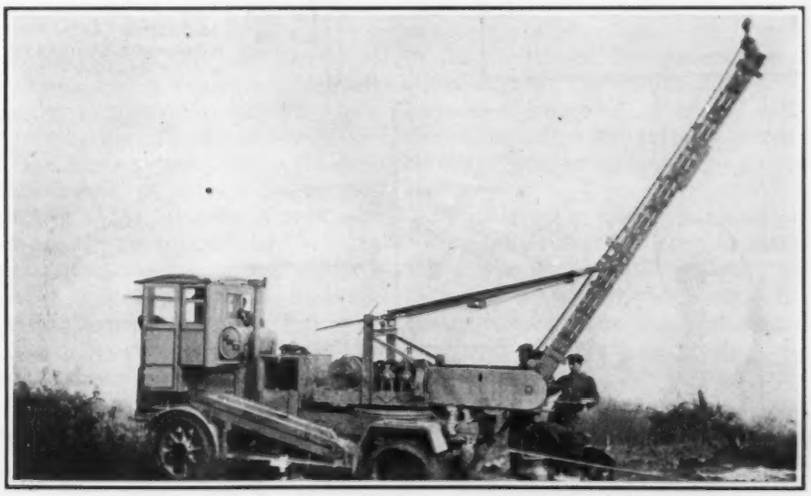


FIG. 2—BY TILTING THE TOWER ANY ANGLE OF DRILL CAN BE OBTAINED

tower"—shown in Fig. 2—carrying the auger shaft is tilted to the proper degree. At the dead-end towers an additional hole is drilled for the braces. This hole is also drilled from the bottom of the 24-in. hole. However, at the dead-end towers the main holes are dug 4 deg. from the perpendicular, while the holes for the braces are dug at an angle of 31 deg. The tower on the boring machine can be easily tilted to any degree necessary to take care of any requirement. The use of this machine for the Union Gas & Electric Company is working out well since the machine has been busy twenty-four hours a day in rushing the completion of transmission lines.

Switchboard for Indicating Tripped Circuits

BY D. D. CLARKE
Electrical Engineer Kansas City (Mo.) Power & Light Company

WHEN one of the automatic substations of the Kansas City Power & Light Company serving an outlying residential section was being built, some means of quickly determining the tripping-out of faulty circuits was desired. Since the substation was to be unattended except for regular routine inspection trips a device was wanted which would tell at a glance which of the circuit breakers had opened. As a result of this need a specially constructed panelboard was installed near the entrance to the substation. The details of this panelboard are given in Figs. 1 and 2. The test board mounted at an angle on the front of the board has a switch which is normally left open. The special signal lamps are then dark. If a circuit breaker or circuit trips out, the lamps on the faulty circuit will light up. The control switching is also so arranged that upon closing this test switch the lamp on the faulty circuit will go out while the other lamps will light up. On the middle of the board is mounted a metering switch which will indicate the energy flow of each circuit.

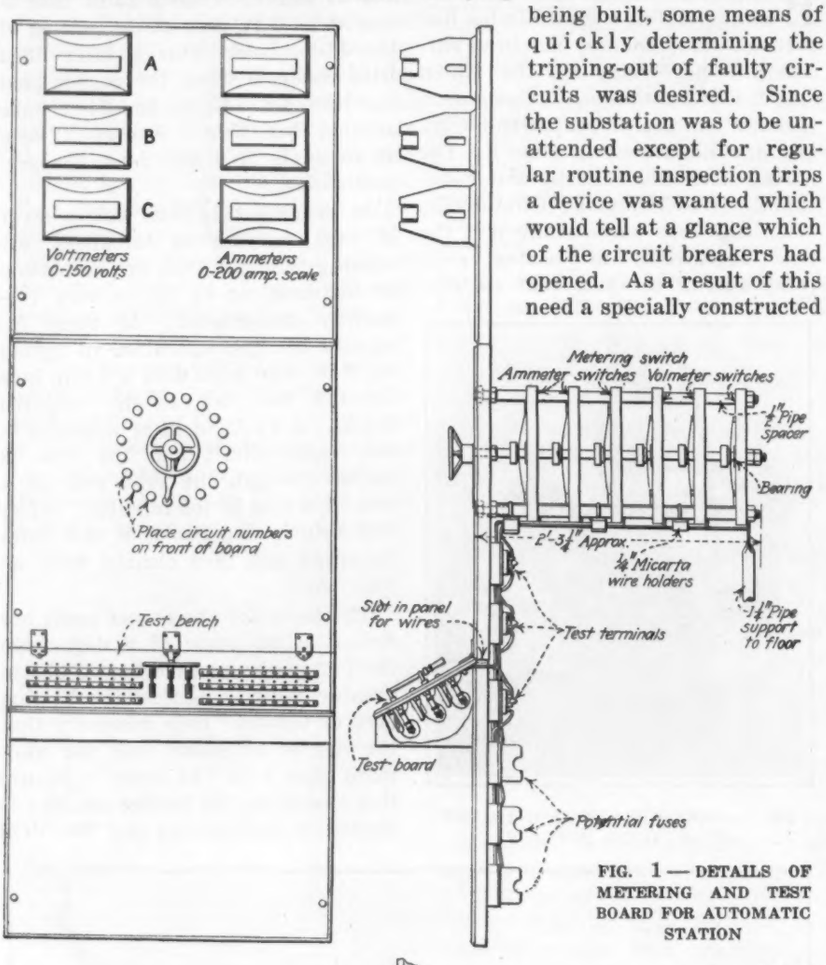


FIG. 1 — DETAILS OF METERING AND TEST BOARD FOR AUTOMATIC STATION

"Trouble-Shooting" Car with Aluminum Body

BY G. G. POST
Electrical Engineer Milwaukee Electric Railway & Light Company, Milwaukee

A SPECIALLY designed removable aluminum body has been constructed in the Cold Spring Shops of the Milwaukee Electric Railway & Light Company for Ford cars used by the trouble service division. The design (Fig. 1) was made with the thought in mind of providing a suitable body of long life and light weight, of arranging for better weight distribution over front and rear axles to obtain better tire mileage and improved performance with less wear and tear on the rear axle and differential, and of permitting the body as a unit to be removed and installed on a new chassis at minimum cost.

The front end is similar to that of a standard coupé, but the body is somewhat shorter. A cushioned seat is provided for the driver only, and to the left of it is a cabinet with drawers for fuses and miscellaneous small parts. When desired, however, a second man can be carried by pull-

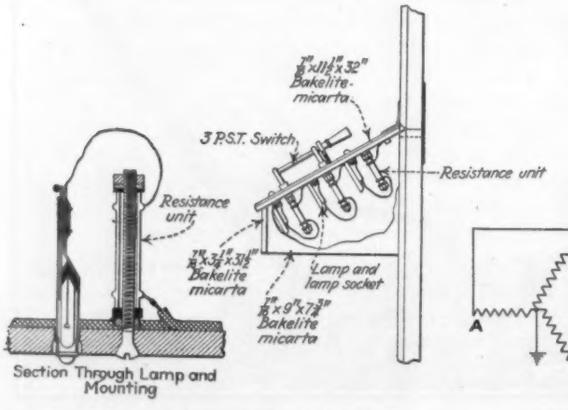


FIG. 2A—MOUNTINGS OF SIGNAL LAMPS AND RESISTORS

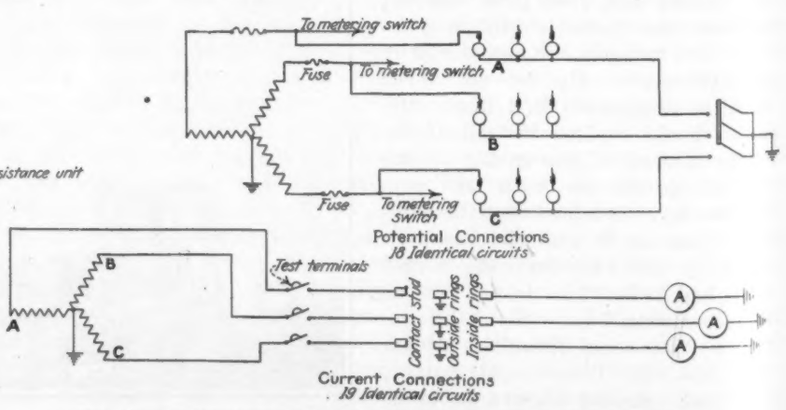


FIG. 2B—SCHEMATIC WIRING DIAGRAM FOR BOTH CURRENT AND POTENTIAL CONNECTIONS

ing out an emergency seat which is just below the cabinet. The body is arranged so that it can carry most conveniently a full line of "trouble-shooting" tools, equipment and material as shown in the accompanying illustration (Fig. 2). The double doors in the rear (Fig. 3) open to disclose shelves and compartments used for carrying various items of equipment. The side doors open into other compartments for rubber goods, tools, etc. Receptacles for pick and shovel are attached to the left-hand side. The top of the body is equipped with pipe railing, and brackets to hold lanterns are installed on either side of the car. Ten cars equipped with these bodies have proved to be very satisfactory in service.

The cost of each body approximates $350. While this is more than the cost of the old-style bodies, the company believes it is justified because of the improved appearance, the additional comfort and protection for the driver and the saving in lower maintenance and operating costs.

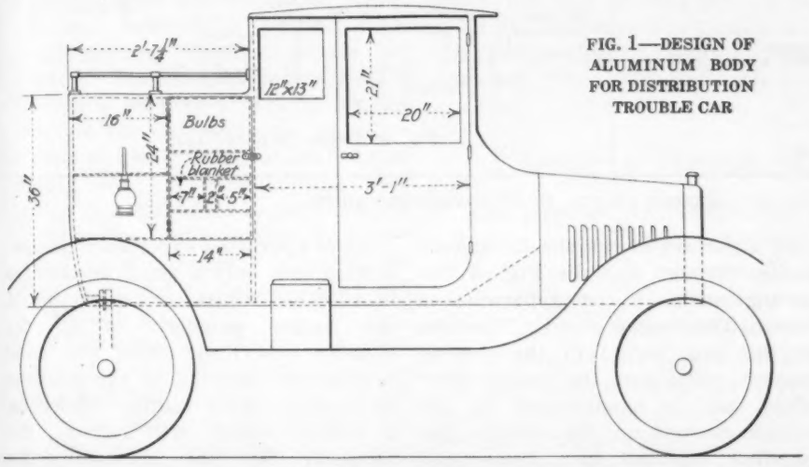


FIG. 1—DESIGN OF ALUMINUM BODY FOR DISTRIBUTION TROUBLE CAR

Methods of Locating Faults on Underground Cables

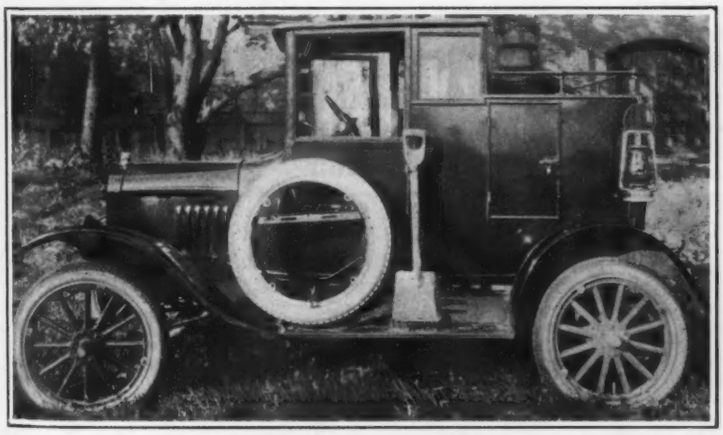
THE characteristics of the more commonly used methods of locating faults in underground cables were discussed by C. T. Sinclair of the United Electric Light & Power Company before the recent convention of the Empire State Gas and Electric Association at Syracuse, N. Y.

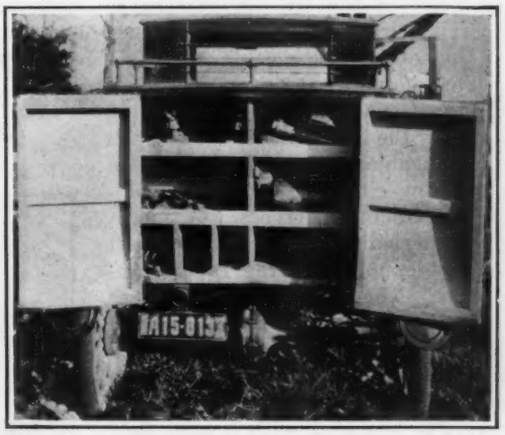
Whenever practicable the approximate location of the fault should be determined by a bridge or loop test with connections similar to those shown in Fig. 1. Since low-resistance faults are requisite to the best performance of all tracing-current schemes, the fault should be thoroughly carbonized by burning with a breakdown set either independent of or incorporated in the fault-locating apparatus.

The "woodpecker" employs an induction coil with a slow-speed interrupter which sends tracing current over the faulty cable. Tests are then made for the presence of this signaling current at various points along the cable by means of an exploring coil and telephone receivers. The connections for this system are shown in Fig. 2. Under ideal conditions the characteristic "woodpecker" note will be heard only on that side of the fault nearer the source of tracing current and will increase in intensity as the fault is approached. However, in practice a note will often be audible over the entire length of the cable, a condition particularly true in case of a high-resistance fault. This method is most successfully used when the tracing current is kept clear of the sheath or other grounds. It is especially applicable to faults of very low resistance and those involving short circuits between conductors but free of ground; it has the advantage of requiring only a few dry cells as the source of power for the apparatus.

The Lundin fault-locating apparatus, shown in Fig. 3, operates on much the same principle, sending out an audible frequency-tracing current which is detected along the cable with telephones and various forms of exploring coils. In addition to the equipment for generating a signal current, the Lundin apparatus includes a source of adjustable voltage obtained with suitable transformers from an alternating-current source.

This current is used in conjunction with an incandescent lamp to make the preliminary fault analysis, to carbonize the failure and to maintain the path across the burn-out. This low-frequency carbonizing current, superimposed on the tracing current which has a frequency of about 600 cycles, maintains the fault at low resistance while the trouble is being run down. This method is readily applicable to live conductors, but is





FIGS. 2 AND 3—SPECIAL ALUMINUM BODIES AFFORD ROOM FOR ALL NECESSARY EQUIPMENT

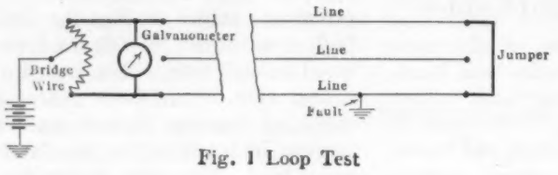


Fig. 1 Loop Test

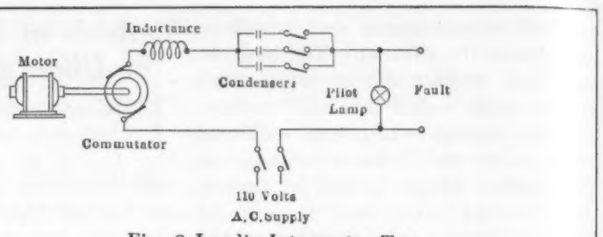


Fig. 3 Lundin Interrupter Test

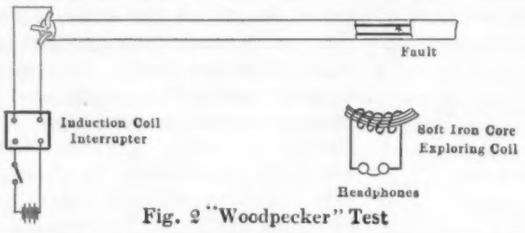


Fig. 2 "Woodpecker" Test

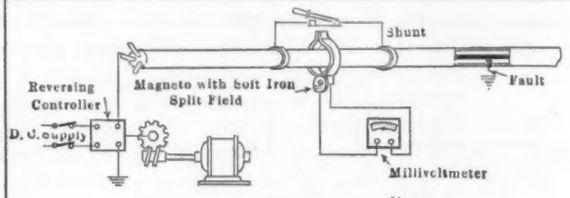


Fig. 4 "Organ Grinder" Test

FOUR METHODS OF LOCATING FAULTS IN UNDERGROUND CABLES

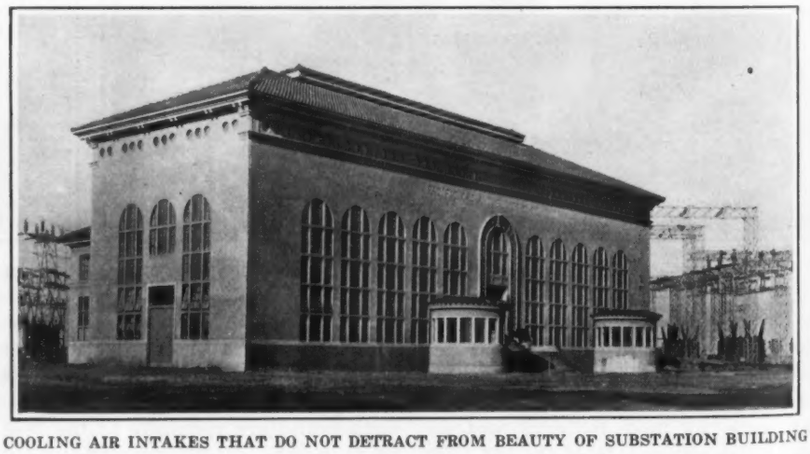
subject to the serious drawback that the "carry-over" effect causes the signal to be audible on both sides of the fault.

A number of other systems employing alternating-current tracing current of audible frequency are also in use. All are more or less objectionable because of the frequent tendency of the tracing current to "carry over" owing to the resistance of the fault and the cable capacity.

The "organ grinder" utilizes unidirectional tracing current to obviate the "carry-over" effect so objectionable in those systems employing either alternating or pulsating tracing currents. A mechanism periodically reverses the direct current supplied to the faulty conductor. The current which passes over the faulty conductor, through the fault and back along the lead sheath and ground sets up a magnetic field around the cable. A magneto provided with a split field is clamped around the cable. Assuming no sheath current, the magneto will generate an electromotive force roughly proportional to the current passing through the conductor. When the armature of the magneto is rotated, there will be a deflection of the zero-center millivoltmeter connected to the magneto terminals and upon reversal of the current the deflection will be in the opposite direction. This periodic reversal serves to differentiate the tracing current from stray sheath currents. In order that the magnetic field of the tracing current returning by way of the lead sheath shall not neutralize the field of the current in the copper conductor, a shunt is clamped around the cable sheath so that a portion of the sheath current passes through it. In Fig. 4 the arrangement of the apparatus is shown. The "organ grinder," because of the long period in the tracing current, eliminates the "carry-over" effect, but is handicapped by the return current in the sheath and requires recourse to a heavy and cumbersome shunt. Unless the fault be grounded, this system proves comparatively unsatisfactory.

Since operating experience demonstrates that only a small percentage of all cable failures are ungrounded, the "organ grinder," of all the systems described, offers the most satisfactory solution to the problem of locating cable faults. However, a system which will remove the necessity for the clumsy shunt across that portion of the sheath to which the magneto is applied should prove a welcome development.

Air Intakes Combined with Architectural Design of Substation



COOLING AIR INTAKES THAT DO NOT DETRACT FROM BEAUTY OF SUBSTATION BUILDING

WHERE substations are conspicuous from main highways or other important thoroughfares it is the policy of the Pacific Gas & Electric Company to pay particular attention to the architectural features of the building design.

This architectural practice is exemplified in the case of the air intakes for the synchronous condensers at the Vaca-Dixon 220-kv. receiving substation, a short distance north of San Francisco. The accompanying illustration shows how these air intakes were made as inconspicuous as possible. One is shown on either side of the main entrance to the building. They are made of the same material as the substation building and are covered with a red tile roof to match that of the main building.

In the design of the substation it was necessary to provide 200 sq.ft. somewhere for the cooling air for the condensers. The method adopted affords an ample supply of clean air and does not detract from the appearance of the building when viewed from the heavily traveled highway directly in front of the property.

Commercial Activities and Public Relations

Southern California Edison Plans Intensive Selling

BY H. C. RICE
Appliance Sales Agent Southern California Edison Company, Los Angeles

THE rapid growth in population and industry in southern California during the last decade has kept the Southern California Edison Company busy in providing for the demand for new service. Sixty-two thousand new consumers, with a connected load of 218,000 hp., were added in 1923, while in 1924, despite the handicap of a temporary power shortage, the company added 46,604 consumers and a total connected load of 103,535 hp.

With many extensions into new territory to serve these new customers it has obviously been impossible for the company to approach any degree of saturation in the sale of service. The company now plans an aggressive campaign to increase the use of energy through existing company equipment by intensive selling to present customers and the addition of new consumers on existing lines where only meter and service are required.

The sales activities during 1925 will be directed toward stimulating the use of service for heating, cooking, sign and decorative lighting, water heating, small domestic motors for pumps and cutting feed, street and highway lighting and for general commercial and industrial purposes. This plan will be carried out through personal solicitation by salesmen, advertising and direct mail appeals. In addition, special campaigns will be put on from time to time featuring energy-consuming devices for heating, cooking or lighting. The first two campaigns of this sort are now under way, one featuring electric ranges and water heaters and the other daylight kitchen units. The range and water-heater campaign will be carried on by direct mail advertising, followed up by a call from salesmen trained in range selling, a method which has always proved successful in southern California.

Kitchen units require somewhat different methods, such as newspaper, direct-mail and street-banner advertising, followed up by crew selling. Results to date indicate that sales can be made to approximately 10 per cent of the domestic lighting consumers. Because of the long daylight hours in the summer, this campaign is planned to terminate about the first of May with a sale of 20,000 kitchen-lighting units, with the probability of being renewed next fall, when it is believed about the same results can be obtained as on the first campaign.

In addition to the sales efforts outlined, it is expected that the same crew now selling kitchen units can be kept busy during the year on other devices, such as percolators, waffle irons, toasters, irons and other similar household labor-saving appliances.

Electric Brass Melting Reduces Costs

Comparison of Cost Records Shows a Saving in Favor of Electric Furnaces Over Coke-Fired Pit Furnaces of $3 to $6 per Ton

BY H. C. THUERK
Commercial Engineer Erie (Pa.) Lighting Company

TWO large manufacturers in Erie, Pa., after an extensive investigation have found that the cost of melting brass in electric furnaces is much lower than its cost when coke-fired pit furnaces are used, and as a result, these two companies are installing sufficient capacity in Detroit electric rocking-type furnaces to melt their entire requirements.

One manufacturer is using a 750-lb. furnace installed in April, 1924, since which time a close watch has been kept on the operation and savings. Some trouble was experienced at first in the frequent breaking of the 3-in. electrodes. This was remedied, however, by equipping the furnace with 4-in. electrodes. Interruptions to the melting process were so reduced by this change that a saving of about 25 kw.-hr. per ton resulted. Difficulty was also experienced with the door bricks of the furnace as only twenty-five to thirty heats could be run before a new door brick was necessary. The furnace at this time was being operated above its normal rating, a fact which was probably responsible for the failure of the door lining. This trouble was eliminated by splitting the door bricks and operating the furnace at more nearly its normal rating. The operation of this furnace has been so satisfactory that two more 750-lb. furnaces and one 250-lb. furnace of the same type are now being installed, after which all brass melting in the foundry of this company will be done electrically. The total transformer capacity for this battery of furnaces will be 500 kva.

TABLE I—MELTING COSTS USING DETROIT ELECTRIC FURNACE

Number of heats		56
Total metal melted, lb.		57,980
Average charge per heat, lb.		1,035
Pouring temperature, deg. F.		2,200
	Total Cost	Cost per Ton
Labor operating furnace	$68.25	$2.35
Maintenance, including lining costs, cement, etc.	45.60	1.57
Electrodes, 102 lb.	22.95	.79
Coke, oil and crucibles for pouring	34.00	1.17
Power, 10,018 kw.-hr., at $0.0175	175.32	6.05
Metal loss, 434 lb., at $0.07	30.38	1.04
Total cost	$376.50	$12.97

MELTING COSTS USING PIT-FIRES

Number of heats		357
Total metal melted, lb.		64,976
Average charge per heat, lb.		182
Pouring temperature, deg. F.		2,200
	Total Cost	Cost per Ton
Labor operating pits	$111.18	$3.42
Crucibles, sixteen at $7	112.00	3.44
Coke, 18 tons at $7	126.00	3.88
Charcoal, 350 lb.	10.50	.32
Hauling coke and ashes	80.00	2.46
Metal loss, 1,068 lb., at $0.07	74.27	2.29
	$513.95	$15.81

(Note.—Maintenance of pit furnaces not included in above costs.)

The Metric Metal Company is also using one 750-lb. Detroit furnace and will install a similar furnace having a charging capacity of 250 lb. early in 1925. It is expected that the two furnaces will handle the entire requirements of the foundry. Until just recently this company had been using a Baily furnace having a charging capacity of 1,500 lb. with a power input rating of 105 kw. Experience has shown that the Detroit furnace would not satisfactorily melt charges containing more than about 15 per cent of very oily chips without producing dirty and porous castings. The old Baily furnace is now being

equipped with oil burners and will be used to pour ingots from charges of scrap and oil chips, as it was found that when melting charges containing more than 15 per cent of very oily chips in the Detroit furnace dirty and porous castings were produced. The ingots will then be melted down in the Detroit furnace for pouring into the molds.

Both of the Detroit furnaces now in operation in Erie are equipped with automatic electrode control, as are also the three additional furnaces being installed at the first plant referred to.

An examination of the melting-cost records at the Metric Metal Company's plant shows a saving in favor of electric furnaces over coke-fired pit furnaces of approximately $3 per ton. The comparison of costs of the pit furnaces and the Detroit electric furnace is shown in Table I.

It will be noted that the average kilowatt-hours per ton was 366, which is rather high and can be accounted for by the high pouring temperature made necessary by thin-walled castings and by the large percentage of oily chips in the charge. The metal melted by these furnaces was a mixture similar to red brass (85 per cent copper, 5 per cent lead, 5 per cent tin and 5 per cent zinc).

The metal loss with the pit furnaces was 1.64 per cent, while with the electric furnace this was reduced to 0.75 per cent. The metal loss for the pit furnaces is very low and represents about the best practice possible.

The other company reports a saving of at least $3 per ton on red brass (85:5:5:5 mixture) according to actual cost figures (Table II) as obtained from the operation of one 750-lb. Detroit furnace. When the three additional furnaces are in operation, savings of at least $6 per ton are expected by this company, as shown in the estimated cost (Table III).

The power consumption per ton of metal melted as given in these comparisons was the energy input to the transformers and therefore includes the transformer loss, which amounted to 7.8 per cent for the 574 heats—equivalent to an input to the furnace itself of about 305 kw.-hr. per ton.

It will be noted that the cost of power per kilowatt-hour will be reduced from 2.3 cents to 2 cents. This is due to the fact that more energy will be used at a better load factor than is obtainable with a single furnace. The labor item will also be greatly reduced as two furnaces can be operated with virtually the same amount of labor as one furnace.

Up to the present this company has been using crucibles for pouring, with a correspondingly high cost for this item. Clay-lined ladles preheated by oil burners will be used when the new furnaces are put into operation. A saving of about $1 per ton is expected from this arrangement.

Allowing $1 per ton for depreciation on the furnaces, the total net saving per ton will be about $6.05 when all four furnaces are in operation. There will be additional savings not included in the above comparison. The present reclamation plant for washing ashes will be dispensed with, space formerly occupied by coke will be available for storage room, and labor conditions will be greatly improved. In addition to all these and more important than any of them will be the greatly improved metallurgical results obtained. Where castings are sold on close specifications, electric melting furnaces are much more satisfactory.

Several other small foundries in Erie are investigating the advisability of using a 250-lb. furnace. Cost comparisons show that many foundries melting as low as 2,000 lb. of metal daily could effect considerable savings with this furnace. One foundry superintendent is considering the use of one of these furnaces for melting monel metal.

TABLE II—MELTING COSTS USING PIT FIRES FOR YEAR 1923

Average charge per heat, lb.	200
Pouring temperature, deg. F.	2,200
	Cost per Ton
Labor operating pits	$3.20
Crucibles, twenty-three heats per crucible, at $6	2.60
Fuel, coke and wood coke, at $7.50 per ton	7.00
Maintenance of pit furnaces	.60
Miscellaneous supplies	.40
Metal loss, 77 lb., at $0.065	5.00
Total cost per ton	$18.80

MELTING COSTS USING ONE 750-LB. DETROIT ELECTRIC FURNACE

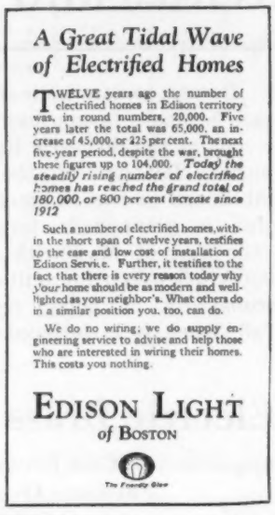
Number of heats	574
Average charge per heat, lb.	815
Pouring temperature, deg. F.	2,200
	Cost per Ton
Labor operating furnace	$2.50
Crucibles, sixty charges, at $6	1.00
Coke for heating crucibles	1.50
Maintenance*	.25
Electrodes, 4 lb., at $0.23	.92
Refractories*	.50
Power, 333 kw.-hr., at $0.023	7.67
Metal loss, 20 lb., at $0.065	1.30
Total cost per ton	$15.64

* Estimated

TABLE III—ESTIMATED MELTING COSTS USING THREE 750-LB. AND ONE 250-LB. DETROIT ELECTRIC FURNACE

	Cost per Ton
Labor operating furnaces	$1.50
Cost of clay-lined ladles and heating of same	1.00
Maintenance	.25
Electrodes, 4 lb. at $0.23	.92
Refractories	.50
Power, 330 kw.-hr. at $0.02	6.60
Metal loss, 15 lb. at $0.065	.98
Total cost per ton	$11.75

Boston Has Big Increase in Wired Homes


A Great Tidal Wave of Electrified Homes
TWELVE years ago the number of electrified homes in Edison territory was, in round numbers, 20,000. Five years later the total was 65,000, an increase of 45,000, or 225 per cent. The next five-year period, despite the war, brought these figures up to 104,000. Today the steadily rising number of electrified homes has reached the grand total of 180,000, or 800 per cent increase since 1912
Such a number of electrified homes, within the short span of twelve years, testifies to the ease and low cost of installation of Edison Service. Further, it testifies to the fact that there is every reason today why your home should be as modern and well-lighted as your neighbor's. What others do in a similar position you, too, can do.
We do no wiring; we do supply engineering service to advise and help those who are interested in wiring their homes. This costs you nothing.
EDISON LIGHT
of BOSTON
The Friendly Giant

A STRIKING instance of the growth of central-station service in the home is illustrated by the above advertisement of the Edison Electric Illuminating Company of Boston, taken from the real-estate section of a local daily. New business is still coming in at a record-breaking pace, and the kilowatt-hour output for the first ten months of 1924 ran ahead of the previous year's corresponding output by 7.2 per cent.

Electric Cooking School

N. E. L. A. Commercial Committee Launches Ambitious Program to Develop Load

THE new commercial cooking committee of the National Electric Light Association, recently appointed by W. R. Putnam, chairman of the Commercial Section, has been completely organized with A. M. Lloyd, Commonwealth Edison Company, Chicago, as chairman. The committee has made good progress with the first portion of its program, the compilation of a complete manual. Other activities which will be undertaken include:

1. The organization in Chicago of a commercial cooking school similar to the schools on industrial heating inspired by the industrial heating committee of the N. E. L. A. The location of this school at Chicago is suggested, as that city has a greater number of commercial electric cooking installations than any other city and affords the opportunity of supplementing the work by inspection of installations.

2. Work in conjunction with instruction in electric cooking at several universities in the United States now placing into effect this class of instruction, particularly Cornell.

3. Organization for close, personal contact with hotel, restaurant and cafeteria associations with the idea of exchanging definite data on electric cooking and co-operating with the educational committee of the American Hotel Association.

4. Arrangements for reprinting and distribution in pamphlet form of helpful articles published in the trade press.

5. Compilation of comprehensive data to assist in determining suitable rates on commercial electric cooking.

6. Compilation and issue of suitable data for architects. Compilation of data on oil ovens, as well as other fuel equipment for cooking, for comparative purposes in selling electrical equipment.

7. Assistance to such schools as bakers' institutes that are in a position to furnish this committee with dependable data on characteristics of electric cooking devices and results obtained under actual operating conditions.

8. Work toward the standardization of switches and all repair parts of manufacturers of this class of products.

Graphic Explanation of Rural Service Costs

THE relatively high cost of serving rural customers was graphically set forth to visitors at the recent Connecticut winter exposition in Hartford by an exhibit contrasting the densities of urban and country development. A model 13½ ft. long by 3 ft. wide showed utility lines serving city, suburban and rural districts, and a booklet was distributed which listed the leading agricultural services of electricity and the opportunities for its wider application and more important fields for future development. The need of larger use of central-station service on the farm for the economic justification of line extensions was made clear, and the low density of patronage per mile of line in the country was emphasized as follows:

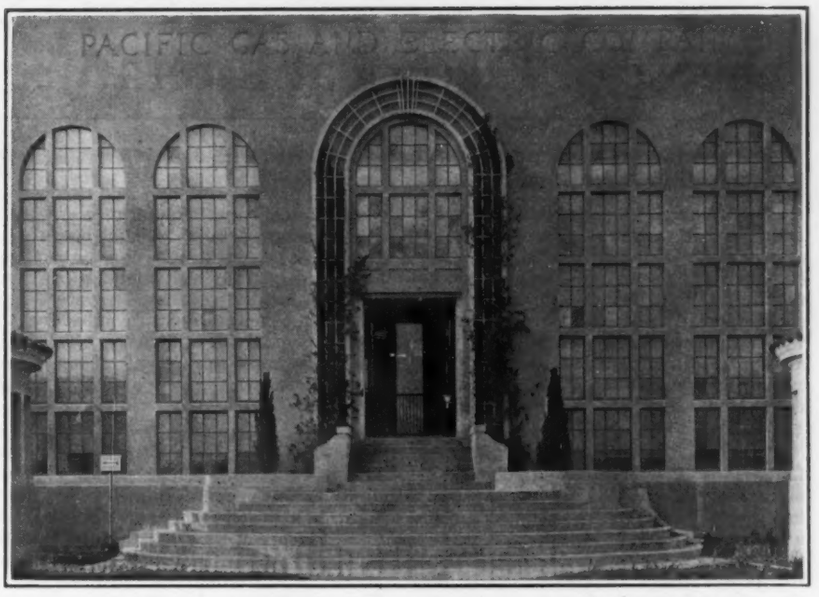
In the cities each mile of electric poles and wires for the distribution of electricity to the home costs at least $2,100. Each mile (covering twelve city blocks) serves about 150 customers. A small payment by each of these customers, without being burdensome, amounts to enough to give a fair return on the money invested in poles and wires to furnish their electric service.

In the suburbs each mile of electric poles and wires for the distribution of electricity to the home costs at least $1,800. Each mile serves about thirty customers.

In the farming districts each mile of electric poles and wires, excluding transformers and meters, costs at least $1,500. Each mile serves about three customers (only 2 per cent as many as in the city). In order to pay a fair return on the money invested in furnishing electric service, each farm customer must either pay a burdensome amount or else use this service for more purposes than the city customer needs to. Moreover, the farm has many more needs for electric service, both in the house and on the farm, because it is not supplied with city water, gas or ice service.

The display was manned by a central-station representative during the exposition, and the cost of the work was about $1,500. The participating utilities were the Connecticut Light & Power Company, Connecticut Power Company, Eastern Connecticut Power Company and the Hartford Electric Light Company.

MODEL SHOWING COMPARATIVE POPULATION DENSITIES SERVED BY UTILITY LINES



OBSERVATION PLATFORM WHERE VISITORS MAY VIEW SUBSTATION

Public Invited to Inspect Utility's Stations

INSTEAD of placing prohibitive restrictions upon public inspection of its plants and stations the Pacific Gas & Electric Company encourages people to visit its property wherever possible, and the company's Vaca-Dixon substation, located on the Pacific Highway in the lower Sacramento Valley, has been especially arranged to facilitate such inspections. This station is of particular interest as it is the terminus of the Pit River 220-kv. transmission lines and is an exemplification of the latest practice in high-voltage substation design.

The accompanying illustration shows an observation platform provided at the front of the building from which those who will not take the time to go through the station may view the interior, where two 20,000-kva. synchronous condensers are in operation. A sign at the side of the door invites visitors to enter the building by the side entrance, where they are met by a guide who shows them over the property. Last year more than one thousand people visited the substation. These visitors were classified, and it was found that 90 per cent were customers.

The building is floodlighted at night, and it is planned to place two attractive electric signs across the highway at the approach from either direction inviting the public to stop and inspect the station. The company feels that the publicity gained has well repaid any expense incurred.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Dam Construction at Tunhovd, Norway.—K. BAALSRUD.—The regulation of the river Numedalslaagen was first considered by the Norwegian government in 1898. Definite plans were decided upon in 1914, and the construction work was started the same year. The author gives a detailed description of the progress of this work, which was completed in 1921.—*Teknisk Ukeblad (Norway)*, Dec. 6, 1924.

Present-Day Heavy-Oil Engines.—J. L. CHALONER.—The development of the oil engine during the last thirty years has taken place in so many directions and the rate of progress has been so rapid and extensive that it is difficult for power users to keep abreast with the salient features of modern oil-engine construction. The author indicates the models available to the British user, discusses details of construction and operating characteristics and gives data on fuel consumption, pressures used and sizes now to be had.—*World Power*, January, 1925.

Electricity in Rochdale.—The article contains some interesting and quite detailed statistics on the domestic as well as the industrial uses of electricity in a Lancashire textile center of 92,700 population. Per capita consumption works out to 15.5 kw.-hr. for domestic lighting, 3.9 kw.-hr. for heating and cooking and 2.8 kw.-hr. for public lighting. Rates are 10 cents for lighting and 2.5 cents for heating; connected motor load, 22,000 hp.—*Electrician (England)*, Dec. 19, 1924.

Electrical Developments in Palestine.—H. HOME.—Two years ago concessions were awarded by the government of Palestine for a hydro-electric development in the Jordan Valley. This valley is a deep rift, 682 ft. below sea level at the Lake of Tiberias to 1,292 ft. below at the Dead Sea. Utilizing the former as a storage reservoir, it is proposed for the present to develop about 80 ft. of the available fall in a plant with three 6,000-hp. units. Transmission will be at 66,000 volts to the main transformer stations at Jaffa, Haifa and Jerusalem. Continuity will be assured by standby Diesel power houses in Haifa and Jaffa. Maps, cuts and rainfall charts accompany the article under consideration.—*Engineering (England)*, Jan. 9, 1925.

Generation, Control, Switching and Protection

Selective Indication of Grounds in Three-Phase Nets.—SVEN NORBERG.—The author gives a discussion of the fundamental principles on which all applications of ground-current relays, whether current magnitude relays or current direction relays, must be based. In practical applications for three-phase networks there are four different cases, the distinction being in the type of connection between the neutral point of the system and ground. This connection can contain (1) resistance only, (2) capacitance only, (3) both resistance and capacitance, and (4) both capacitance and inductance. These cases are, in reality, special cases of a general system, which can be treated analytically. By considering the conditions in this general system the author arrives at definite rules for the application of ground-current relays in the individual, practical cases.—*Teknisk Tidskrift (Sweden), Elektroteknik*, Jan. 3, 1925.

Electric Power as a By-product of Process Steam Generation.—THEODORE MAYNZ.—After showing that it is ordinarily more profitable for an industrial concern to buy rather than to manufacture its power, the author presents the case when large quantities of steam are needed for process work. Numerical examples are given for various cases justifying the use of high-pressure engines or turbines exhausting into process mains, of bleeder or extraction turbines or of low-pressure or mixed-pressure turbines using process exhaust.—*Chemical and Metallurgical Engineering*, Jan. 5, 1925.

Power-Station Efficiency in Britain.—Daily and yearly load curves and charts of fuel and steam consumption are given for two stations. They were selected as representing progressive practice rather than the highest efficiency and are Stepney, with three 10,000-kw. turbo-alternators installed, and Hackney, with two 8,000-kw. and two 4,000-kw. units. Factors affecting operating economy are discussed.—*World Power*, January, 1925.

Transmission, Substations and Distribution

Outdoor Substation Equipment.—This is a review of recent British practice. Thirty-three thousand volts is becoming a recognized pressure for linking up power systems. Several installations are illustrated and described.—*Electrician (England)*, Dec. 19, 1924.

Mechanical Characteristics of Transmission Lines.—I, Conductor Characteristics, Wind and Ice Loading.—L. E. IMLAY.—Since the weight of conductors has an important bearing on the design of supporting towers, the author first gives physical data for the commercial conductors in common use—i.e., copper, aluminum, copper-clad steel, steel-reinforced aluminum and steel. These are contrasted and the considerations which would govern in particular cases are indicated. The influence of ice, wind, temperature and geographical location are next considered. Full tables are given for both single and bimetallic wires and cables; weight, ultimate strength, working load or elastic limit, modulus of elasticity and temperature co-efficient. The series is to be continued.—*Electric Journal*, January, 1925.

Three-Phase Cables.—R. DIETERLE.—For the underground transmission of three-phase energy not exceeding 35 kv. triple-conductor or six-conductor cables are in common use. In the latter each phase is carried by two conductors; hence their name, split-conductor cables. The author investigates in this paper the advantages and disadvantages of these two kinds of cables. For the same total copper cross-section the six-conductor cable has 30 to 60 per cent higher capacity, depending on the connection of the six conductors. The inductance of the triple-conductor cable is about twice that of the six-conductor cable. Dielectrically the six-conductor cable is stressed higher and does not seem to be economical for more than 20 kv. From the heating standpoint the six-conductor cable is far superior to the triple-conductor cable. In operation the six-conductor cable has the added advantage that in case of failure of one conductor the remaining wires represent a large amount of reserve.—*Elektrotechnische Zeitschrift*, Dec. 11, 1924.

Units, Measurements and Instruments

Overload-Proof Ammeters.—F. VOLLER.—Soft-iron-type ammeters, used in conjunction with motors, have the common fault that their scale is so proportioned as to make exact reading of low or no-load current impossible. As the starting current of motors is usually several times normal current, the scale has to be extended to values far beyond rated current to prevent violent knocks against the pointer by the end peg. To improve this condition, ammeters have been developed with a movable iron vane so shaped and placed within the coil as to give a maximum torque with a low current, which decreases toward the end of the scale. For example, an ammeter for 100 amp. end value begins to read at 4 amp. and gives fine-scale intervals up to 70 amp., followed by marks for 80, 90 and 100 amp. For very rough services, such as cranes, traction motors, rolling mills, electric furnaces, etc., this principle can be carried still further, and the instruments are so designed that beyond a certain maximum current the torque reverses. Such an instrument does not need an end peg, because a damping action is exerted upon the movable system if the maximum current is exceeded.—*Elektrotechnische Zeitschrift*, Dec. 18, 1924.

Multi-Rate Meter.—F. EKERT.—The author describes a multi-rate meter system, which can not only take care of any desired number of rates, but which at the same time is applicable to the existing, ordinary straight-rate meters. A pilot wire is run from the central station to every installed meter, and by means of a small relay a current impulse over this pilot wire can be made to disconnect for any desired length of time the voltage winding of the meter, thus stopping it. At the station the pilot wire leads to a clock, which actuates contacts so arranged that an impulse is sent over the wire about every fifteen seconds throughout day and night, but the duration of each impulse is different. If it be assumed, for example, that the station has decided upon four rates, the meters will be stopped for one second every fifteen seconds during the highest-rate hours. They will be stopped for two seconds

every fifteen seconds for the next lower rate, three seconds every fifteen seconds for the next lower, and so on. In other words, by regulating the lengths of the periods of stoppage any desired rate can be recorded. Such a meter will therefore not register the actually consumed number of kilowatt-hours, but it will indicate in a single sum the amount due. Such meter systems have already found wide use in Switzerland, in some communities taking care of six rates during twenty-four hours. — *Bulletin de l'Association Suisse des Electriciens*, December, 1924.

Illumination

Effect of Light on Plant Growth.— Abstracts of the following papers on this general subject, presented at the annual convention of the I. E. S. and published in full in the issue to which credit is given below, may be found in the ELECTRICAL WORLD report of the annual convention, Nov. 1, 1924, page 961: "Summary of Literature on Some Phases of the Effect of Light on Plant Growth," by Henry W. Popp; "Discussion of the Work at the Boyce-Thompson Institute and Its Applications," by Dr. William Crocker; "Influence of Colored Light on Plant Growth," by Samuel G. Hibben, and "Stimulation of Plant Growth by Means of Electric Lighting," by Victor A. Tiedjens. — *Transactions of I. E. S.*, December, 1924.

Tungsten-Filament Lamps. — The arguments in the hearing before the Law Lords in the House of Lords relating to the British Thomson-Houston Companies tungsten-filament lamp patents are reported at considerable length.—*Electrician* (*England*), December 19, 1924.

Relighting Atlantic City's Boardwalk.—T. P. BROWN.—The new equipment furnishes the choice of three intensities, and the units are designed for an asymmetric distribution so that the light to the beach and to the boardwalk is proportioned to their respective needs. Each standard contains a 200-watt and a 750-watt lamp on separate circuits. The filament of the large lamp is at the principal focus of an ellipsoidal reflector, and the rays are again redirected by a plant reflector beyond the conjugate focus. Foot-candle intensities are: Average over whole area, 1.57; average in line of standards across boardwalk, 2.40; average midway between standards across walk, 0.99. Illumination curves are shown for the old and the new system under various conditions.—*General Electric Review*, December, 1924.

Motors and Control

Notes on Phase Advancers. — F. CREEDY.—This is one of a series of articles on electrical machines. The common underlying principle of all phase advancers is that the magnetic energy of the field of an induction motor must between cycles be stored in some form instead of flowing back as a lagging current in the supply circuit. In the Kapp vibrator the stored energy is rotational in small armatures of separately excited direct-current machines (usually three in practice) which are connected between adjacent rotor bars or windings. These armatures vary in speed between zero and maximum once per slip cycle. At slip frequencies of one or two cycles per second the Kapp vibrator can be replaced by a secondary cell (Wall's phase advancer). In the Scherbius machine a direct-current armature is connected by way of brushes and commutator to the rotor of the induction motor. There is no field winding. The armature is driven mechanically through the flux established by its own currents. The interchange between magnetic and rotational energy takes place as in other cases. The action of each type of advancer is explained in some detail, with diagrams.—*Electrician* (*England*), December 19, 1924.

Lap Windings with Unequal Coil Groups.—C. R. RIKER and A. M. DUDLEY.—Method of laying out a balanced polyphase winding or of determining the amount of distortion if true balance is impossible. Diagrams and tables accompany the article.—*Electric Journal*, January, 1925.

Electric Journal, January, 1925.

Effect of Unbalanced Voltages on the Operation of Induction Motors.—O. C. SCHOENFELD.—A method for determining the actual effect of unbalanced voltages on torque, currents, efficiency, power factor and heating is given. The solution is based on the theorem that an unbalanced polyphase system may be resolved into two balanced systems with opposite phase rotations. The most serious effect is shown to be the enormous unbalance of current with a comparatively small unbalance of voltage, 100 per cent of the former with 10 or 15 per cent of the latter.—*Electric Journal*, January, 1925.

Electrophysics, Electrochemistry and Batteries

Study of Crystal Structure and Its Applications.—Part II, *Crystal Lattices.*—WHEELER P. DAVEY.—In this second installment of a series of articles on crystal-structure analysis and its applications in theoretical and industrial fields, the author describes and illustrates the different ways in which crystal lattices are built up. By means of relationships between the characteristic equations for the different types of crystals the connections between the crystal families are shown. An idea of the applications of crystal analysis is given in the calculation of density from measurements determined by X-ray methods.—*General Electric Review*, December, 1924.

Applications of Hydro-Electric Power: III.—The Electro-Chemical Industries.—T. J. MIRCHANDANI.—Reference to the first parts of this serial has been made in an earlier issue of the Digest. Adequately to abstract this third part would almost necessitate quoting it *in toto*, because of the abundant data on the power requirements of the electrochemical industries. Among them are a table of kilowatt-hours per ton for forty-six products from aluminum to zinc, a comparison of the energy demands of competing processes where such exist, and indications, for a number of products, of the degree to which cost of energy affects total cost.—*World Power*, January, 1925.

Mathematical Theories of Puncture of Dielectrics.—L. DREYFUSS.—In this mathematical paper the author deals with the laws governing the puncture of flat plates of insulating material between flat metal electrodes. Depending upon the thickness of the insulator and the degree of its homogeneity, these laws must be derived either from the theory of quasi-homogeneous dielectrics or from the canal theory of inhomogeneous material. For both assumptions the disposal of the heat from losses through the material itself and through the electrodes is carefully analyzed and the laws for puncture are determined. Contrary to statements made by K. W. Wagner, the canal theory leads to the result that the puncture voltage is no simple function of the thickness of the plate, but that it depends largely upon the extent of the faulty place in the inhomogeneous material. The great practical value of this article is the fact that the author's dissertations apply also, with very slight augmentations, given in the paper, to insulating cylinders such as are used for the major insulation in high-voltage transformers. Several practical examples explain the use of these theories for tests on such cylinders.—*Bulletin de l'Association Suisse des Electriciens*, December, 1924.

Telegraphy, Telephony, Radio and Signals

Directive Transmission in Radio-Telegraphy.—G. W. O. HOWE.—Several methods that have been developed from time to time are described and illustrated. A polar curve of radiation, reproduced from a paper by H. Chiriex in "Radioélectricité" for July, shows the highly directional effect of a group of fifteen aërials arranged in three parallel rows, when suitable provision is made for insuring the proper phase displacement of the currents in the individual aërials. Several systems using reflectors are discussed.—*Electrician* (*England*), Dec. 12, 1924.

Inductances of Polygonal Coils.—I. KOGA.—The author discusses and derives formulas for triangular, hexagonal and octagonal coils. These formulas are very accurate, even in the case of a small number of turns and considerable length of pitch.—*Journal of Institute of Electrical Engineers of Japan*, No. 435.

Speeding Up the Telegraph. — DONALD MURRAY.—This paper read before the Institution of Electrical Engineers, and reported in abstract, is a forecast of probable developments. The author believes that many communications now going by telephone should go by telegraph. The need for skilled operators is eliminated by the development of the printing telegraph, of which he advocates the introduction in business offices, with interconnection facilities like those of the telephone exchange. The advantages claimed are greater accuracy, the possibility of speed forty-five times as great, a permanent record and much lower costs, especially for long distances. He cites evidence of the beginnings of such a system in America. The discussion following the paper is also reported.—*Electrician* (*England*), Dec. 26, 1924.

New Books

Circuit Troubles and Testing

By Terrell Croft. New York: McGraw-Hill Book Company, Inc. 224 pages, 237 illustrations. Price, $2.50.

Locating trouble in electric circuits is an important part of every electrical worker's duties. The kinds of trouble and the methods of locating them under all manner of combinations of defects that may occur on electric circuits present a problem by no means simple. For detecting these faults devices in great variety have been evolved of both home-made and commercial products. The author of this book has not only gone into the problem of locating faults on electric circuits, but he has also given descriptions of the testing equipment and how it operates.

The work is divided into six chapters dealing respectively with instruments and devices for making tests, the location of faults in multiple transmission and distribution circuits, the location of faults in interior wiring circuits, the location of faults in series circuits, insulation resistance testing, and determining polarity.

Arc Welding Handbook

By C. J. Holslag. New York: McGraw-Hill Book Company, Inc. 250 pages, 50 illustrations. Price, $2.

This book is intended to serve as a simple and practical manual of instruction in arc welding. Methods are described, step by step, in a clear and practical manner so that the beginner may understand both the equipment and the processes. To the engineer, draftsman and designer the book should be valuable as a guide in the use of arc welding. The book should also prove useful to teachers in technical, trade and other schools where instruction in arc welding is offered. For this purpose questions have been added at the end of each chapter, based on the information given in the chapter. In the last chapter a very complete list of welding terms and precise definitions of them are given.

Magnets

By Charles R. Underhill. New York: McGraw-Hill Book Company, Inc. 468 pages, 467 illustrations. Price, $4.

After a broad treatment of the general principles of apparatus electromagnetically operated and controlled, the author treats in detail electromagnets and permanent magnets. The materials composing the structures of magnets, the relative physical dimensions of the various parts and the phenomena associated with them are carefully considered. Since electric motors and other electromagnetic devices to be controlled are operated from both alternating-current and direct-current circuits, these general circuits and their characteristics are explained.

Equations have been used as sparingly as possible, the mathematical deductions having been translated into the text with the law of conservation of energy as a basis and the mathematics then eliminated. Numerous examples are worked out to illustrate the subject matter. It is shown that alternating-current electromagnets are almost as easily designed as direct-current electromagnets when the magnetic flux due to the electric current is separated from the magnetic flux inherent to the magnetic material.

Electricity Supply Costs and Charges

By H. M. Sayers. London: The Electrical Review, Ltd. Paper, 80 pages, illustrated.

This little monograph on the proper way to determine costs and charges for electricity is well written and stimulating. The influence of load factor and diversity factor on costs is gone into in detail, and through clear definitions of terms the author makes his points admirably. The approach of the engineer rather than the accountant is used, and costs are determined primarily as a background for rate making. The use of kw. demand instead of kva. demand as a basis for fixed charges and consideration of station equipment operating as power-factor corrective apparatus are points omitted by the author which would appeal to some students of power costs. The book is well worth while and merits study.

Schüttel-Schwingungen

By A. Wichert. Berlin: V.D.I. Verlag. 120 pages, 138 illustrations.

In all civilized countries the electrification of main railroads has assumed national importance and has brought with it very close investigations of electric locomotive design. In spite of widely varying opinions as to the current system generally best suited, satisfactory solutions have been found for every system as far as economical operation is concerned. From the mechanical standpoint, however, the results obtained have not always been so good. It was found in particular that in virtually all electrical engines where the motor power is transmitted to the driving wheels by rods very pronounced vibrations sometimes occur at certain critical speeds. On some locomotives these are of such magnitude as to destroy the driving mechanism in a very short time. This baffling problem, which apparently did not lend itself to a mathematical investigation, caused much heated controversy and experimental research.

In this book the author reviews the various hypotheses and develops a new graphical method to explain and to remedy this fault for any design of locomotive. By means of a specially designed instrument to record mechanical vibrations, he is able to show how his theory checks with results actually obtained. He maintains that properly dimensioned springs and shock absorbers built into the driving mechanism will reduce dangerous vibrations in all cases to a tolerable minimum. Designers of rod-drive locomotives will find in this book a great deal of information on a phase of the mechanism of electric locomotives on which nothing has so far been published in book form.

Book Notes

Mechanical World Year Book for 1925. Manchester and London: Emmott & Company. 348 pages.

A feature in this year's handbook is a new section dealing with surface condensers for steam turbines in which the principles governing the design of such apparatus are fully explained. The sections on gas, oil and Diesel engines and suction-gas producers have been rewritten and new information has been incorporated. Many of the other sections have also been completely revised.

Aufgaben aus der Maschinenkunde und Elektrotechnik. By Fritz Suchting. Berlin: Julius Springer. 235 pages, 88 illustrations.

This handbook contains a random collection of 112 problems such as may confront an electrical engineer in the field or on the consulting desk. Great care has been taken to show very exactly and step by step the mathematical method used to solve each of these problems, which are of such a nature as to cover a wide variety of electrical and mechanical every-day tasks. No calculus is used.

Mesures Télégraphiques et Téléphoniques. By Georges Valensi. Paris: Gauthier-Villars et Cie. 277 pages, 158 illustrations.

The contents of this book have been used since 1919 as the basis for the training of telegraph engineers at the Parisian electrotechnical college. It covers all the various measuring methods which are being used today for the testing and maintenance of telegraph and telephone lines, treating the subject from the scientific standpoint only.

Workshop Gauges and Measuring Appliances. By Louis Burn. New York and London: Isaac Pitman & Sons. 154 pages, 71 illustrations, 20 tables.

The author presents an introductory treatise on the principal measurements required and the instruments used in workshop practice. The book covers standards, units of measurements, simple and indirect measurement, micrometers, marking off, selection and care of instruments, and limits and fits.

Arc Welding and Cutting Metal. Schenectady: General Electric Company. 127 pages, 168 illustrations.

This book deals in a practical way with some of the applications of electric arc welding and provides a simple and logical method by which one may acquire a certain familiarity with this class of welding. The book is divided into three parts, the first giving a general description, the second a training course, and the third illustrations and applications.

Friction Clutches. By R. Waring-Brown. New York and London: Isaac Pitman & Sons. 124 pages, 77 illustrations. Price $5.

This is a handbook for mechanical and automobile engineers, designers and students in which the author has presented in concise and complete form the fundamental principles involved in the design and operation of all types of friction clutches. Many recent devices are illustrated and described, and modern applications of these clutches to many types of equipment are shown.

Books Received

Alternating-Current Rectification. By L. B. W. Jolley. New York: John Wiley & Sons, Inc. 352 pages, illustrated. $5.

Household Refrigeration. By H. B. Hull. Chicago: Nickerson & Collins Company. 328 pages, illustrated. Price, cloth, $3.50; morocco, $4.50.

Connecting Induction Motors. By A. M. Dudley. New York: McGraw-Hill Book Company. 361 pages, illustrated. Price, $3.

Bau Grosser Elektrizitätswerke. Second edition. By G. Klingenberg. Berlin; Julius Springer. 608 pages, illustrated. 45 gold marks.

Electrical Measuring Instruments. By C. V. Drysdale and A. E. Jolley. London: Ernest Benn, Ltd. 475 pages, illustrated. 55 shillings net.

Ions, Electrons and Ionizing Radiations. Fourth edition. By James Arnold Crowther. New York: Longmans-Green Company. 328 pages, illustrated. Price, $4.

Elements of Electrical Engineering. By Arthur L. Cook. New York: John Wiley & Sons, Inc. 568 pages, illustrated. $4.

News of the Industry

Maryland and Conowingo

State Commission Still Withholds Assent to Susquehanna Plans, but Compromise Likely

WHAT was apparently an unexpected obstacle to immediate approval of the plans of the Susquehanna Power Company for the construction of a hydro-electric plant near Conowingo Md., involving the expenditure of $52,000,000 arose when attorneys for the Pennsylvania Water & Power Company filed a protest with the Maryland Public Service Commission. According to the protest, the erection of a dam 103 ft. high at Shure's Landing, as is contemplated, will endanger the water rights of the Pennsylvania Water & Power Company, which has generating stations at Holtwood, Pa., and in Baltimore and supplies energy to the Consolidated Gas, Electric Light & Power Company of the latter city. Other protestants were the Allied Building Trades Council of Baltimore and the Baltimore Federation of Labor, which feared a setback to the industrial development of Maryland's chief city from the exportation of the power.

A conference was held at which J. E. Aldred president of the Pennsylvania Water & Power Company and chairman of the board of the Consolidated company of Baltimore; Herbert A. Wagner, president of the Consolidated company; W. C. L. Eglin, chief engineer of the Philadelphia Electric Company; George P. Roux, consulting engineer, Philadelphia; Francis T. Homer and Luther M. R. Willis, who are directors of the Susquehanna company, and Charles Markell, counsel for the Consolidated company, were present, but no settlement acceptable by all was achieved. When the Maryland commission met, however, representatives of the Pennsylvania Water & Power interests did not appear, and it was intimated that a working agreement would probably be arrived at.

Jurisdiction Over Agreements

The question of jurisdiction over intercorporate agreements was brought up. Finally People's Counsel C. W. Miles of Baltimore proposed that a conference between the commissions and state officials concerned to decide how far the development could be regulated be held prior to approval of the general plan. This was agreed to, and invitations will be issued to the members of the Federal, Maryland and Pennsylvania commissions, the Attorneys General of the two states, the officials of the Susquehanna Power Company and others. This meeting will take place soon, probably in Washington.

On Tuesday Governor Ritchie of Maryland, after a conference with Harold E. West, chairman of the Public Service Commission, and Mr. Miles, announced it to be the policy of the state that reservations providing for the sale of all electric power needed in Maryland, including Baltimore, before power is exported to other states must be entered in the contracts between companies involved in the development as a condition of the approval of the project by the Maryland commission. Replacement of all state property, bridges, highways and property of the State Roads Commission, the protection of fish in the Susquehanna River and agreements on the rights of Maryland communities for water rights in the river will be demanded before construction plans are approved.

New Mexico Association Postpones Convention

The convention of the New Mexico Electrical Association, which was scheduled to be held at Albuquerque next week from February 16 to 18, has been indefinitely postponed on account of the fact that urgent business would make it impossible for many representatives of the principal central-station companies to attend. The convention is likely to be held about the middle of March, it is thought, but no date has been officially set.

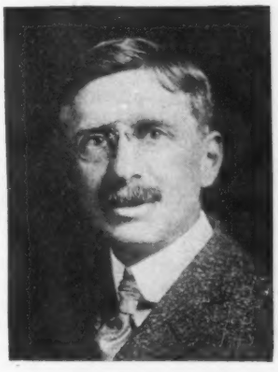
Scranton to Have Ten-Million-Dollar Plant

Scranton (Pa.) newspapers state on the authority of Duncan T. Campbell, general manager of the Scranton Electric Company, that 460 acres of land along the Susquehanna River, 2 miles above West Pittston, have been acquired by that company as the site for a future plant to serve Scranton and other places in the Lackawanna and Wyoming valleys. The cost of the new plant is estimated at $10,000,000 and tentative plans call for the initial installation of two single-unit turbines rated at 40,000 kw. each. The plant will be steam-operated and similar to the Philo plant now being built near Zanesville, Ohio, for the Ohio Power Company, which, like the Scranton company, is a subsidiary of the American Gas & Electric Company.

Midwinter Convention of A. I. E. E.

Attendance Passes the Thousand Mark—Technical and Entertainment Meetings Are Alike Attractive—Edison Medal Presented to John W. Howell

THE midwinter convention of the American Institute of Electrical Engineers was held in the Engineering Societies Building, New York City, on February 9 to 12. A registration of more than one thousand attested the interest taken in the unusually attractive technical program presented. All sessions were well attended, and the discussions were excellent. A full report of the technical sessions will appear in the ELECTRICAL WORLD next week.



JOHN W. HOWELL

Under the able direction of H. H. Barnes, chairman of the convention entertainment committee, the social features of the convention left nothing to be desired. On Monday night more than eight hundred attended a smoker at the Hotel Astor and enjoyed motion pictures, "magic," music and other entertainment arranged by F. M. Feiker, chairman of the smoker committee. On Thursday night six hundred attended the annual dinner-dance at the Hotel Astor. Under the direction of H. A. Kidder, chairman of the committee in charge, this feature also was very successful. In addition to these social and entertainment affairs, Chairman L. F. Morehouse of the general convention committee arranged for inspection trips to points of interest. The trip to the Hudson Avenue station of the Brooklyn Edison Company in particular proved very popular.

Howell Gets Medal

On Wednesday night the Edison medal was presented to John W. Howell "for his contributions toward the development of the incandescent lamp." John W. Lieb, vice-president New York Edison Company, made the presentation address, outlining ably the progress of illumination and the many contributions to it made by Mr. Howell. President Farley Osgood then presented the medal, Mr. Howell accepting it in an address of high caliber.

Following the Edison medal ceremonies, Major-General Mason M. Patrick, Chief of Air Service in the army, gave a lecture on "Military Aircraft and Their Uses." It was listened to with much interest by a large audience.

Oliver Heaviside Dead

Strange Career of England's Electrical and Mathematical Genius Ends

NEWS comes from England of the death at the age of seventy-seven as the result of a fall from a ladder, of Oliver Heaviside, who despite himself had won fame in his chosen field of electromagnetism and upon whom the Institution of Electrical Engineers, the leading British electrical society, had only last year conferred a gold medal because of his eminence as an exponent of electrical science. That Heaviside's name was absolutely unknown to the general public even in his own country was due to the peculiar mentality of the man himself—a mentality superinduced perhaps by the fact that he had been from boyhood virtually stone deaf. Save for a time in early life when he was in the government service, he lived the life of a recluse, shunning social intercourse of every sort, but this did not prevent his mathematical genius and its fruits as applied by him to electromagnetic radiation from being recognized by the electrical engineering profession in Great Britain, and this recognition spread to other countries. Leading members of his profession in America have been loud in praise of his accomplishments, and he was regarded as an illustrious successor to Wheatstone (who was his uncle by marriage), Clerk Maxwell, Kelvin and other great British electro-scientists.

Yet Heaviside would in all probability have died in the complete obscurity which he courted had he not many years ago submitted by mail to Sir John Pender, then editor of the London *Electrician*, a communication which Pender at once recognized as of very unusual value. In writing to the London paper Heaviside directed that any remuneration should be sent to a certain grocery which he designated. Apparently at that time he was living in extreme poverty. He continued to send in articles to the *Electrician* and to receive remuneration in the same manner, but persistently refused to answer letters or to reveal his abode. Eventually leading scientific men of London are said to have succeeded in literally forcing a pension upon him, but he never really emerged from his shell. He was a bachelor, lived in his latter years in a Devonshire cottage, and no photograph of him is known to be in existence. Probably very few of his admirers ever met him face to face, though the Royal Society elected him to a fellowship and the American Institute of Electrical Engineers (in 1918) to honorary membership. Many stories of his eccentricities are told, one of these being that he persisted in interpolating abominable puns in the middle of abstruse passages contained in his articles.

Only the most skillful mathematicians can follow his theories through. Notwithstanding this, his writings have had a practical value. For instance, starting with a mathematical theory, he proved the value of self-induction in long-distance telephony, a method quickly adopted in America (where the same conclusions were independently reached by Dr. M. I. Pupin) and Germany, though long rejected by the British Post Office. In the early days of wireless Heaviside was the first to declare that electrical waves, in traveling over the mountain of water 150 ft. high that lies between England and America, would accommodate themselves to the surface of the sea in the same way as they follow a metallic wire. He further pointed out that there probably was an upper layer of air which would act as an upper guide for electric waves. This layer is now called the Heaviside layer.

His papers contributed to the *Electrician* were collected and published as "Electrical Papers" in two volumes in 1892. But his fame will rest on his "Electromagnetic Theory" in three volumes (1893-1913), published by Macmillan. The sources of his greatness will, however, be sought in vain in encyclopedias, which know him not.

"Power Trust" Investigation Ordered

Senate Adopts Norris Resolution by Fifty-five to Twenty-five, Defeating by Smaller Majority an Amendment to Obviate Questioning of Stockholders

THE United States Senate by vote of fifty-five to twenty-five on February 9 adopted the Norris resolution providing for an investigation of the General Electric Company by the Federal Trade Commission. The majority included virtually all the Democratic Senators and the radical Republicans as well as others.

The resolution as passed differs from its form as printed in the ELECTRICAL WORLD for February 7, page 313, by the inclusion of the following paragraph, added by Senator Norris:

"The commission shall also ascertain and report what effort, if any, has been made by the said General Electric Company or other corporations, companies, organizations or associations, or any one in its behalf, or in behalf of any trade organization of which it is a member, through the expenditure of money or through the control of the avenues of publicity, to influence or control public opinion on the question of municipal or public ownership of the means by which power is developed and electrical energy is generated and distributed."

An effort on the part of Senator Harrison of Mississippi to broaden the investigation to include all power companies was voted down by twenty-one to fifty-six.

Senator Watson of Indiana, representing, it is believed, the administration viewpoint, attempted to amend the Norris proposal by precluding the investigation of stockholders or other security holders of the General Electric Company. His amendment was opposed on the ground that it was necessary to investigate more than the General Electric Company proper to establish whether or not a monopoly exists and that this could not be done without examining stockholders. The Watson amendment was rejected by a vote of thirty-two to forty-three.

Senator Norris contends that there has been large-scale propaganda in an effort to discredit municipal ownership of public utilities. It is believed that many of those who voted for the Norris resolution think it is unnecessary and is an effort to boost public ownership, but at the same time they had no information as to the conduct of the company and did not feel justified in voting against the proposal. Others think that Senator Norris has staked a good deal on a single card in the hope that something may develop to bolster up support for public ownership, which, following the election, has waned.

There is a feeling, however, that the investigation may prove to be a great disappointment to those who conceived it, despite the fact that the Federal Trade Commission has, in the opinion of some, occasionally allowed prejudices against business to color its fact finding. The attitude of the General Electric Company that it would prefer to have the investigation go forward so that it may be cleared of the charges has created a good impression among the legislators.

Brown-Boveri Plans

Negotiations Are Under Way with Wagner, Cramp and Other American Firms

RECENT developments of the plan to form an American corporation affiliated with Brown-Boveri interests and holding the patent and sales rights of the Swiss manufacturing company, though financed and organized in this country, are that negotiations are under way with the Wagner Electric Corporation, William Cramp & Sons and several other firms. In a letter to stockholders W. A. Layman, president of the Wagner Electric Corporation, said, under date of January 29:

"Press announcement has been made in New York City of the plan to organize a new electrical manufacturing and importing company which will have for the United States and their territories exclusive manufacturing rights under all engineering designs and patents and exclusive merchandising rights for the European-made products of one of the largest European electrical corporations. Under the organization plan of the new company, a number of existing American electrical manufacturing plants will be acquired as a basic nucleus for production in the United States.

"Proposals have been made to the directors of your corporation looking to the inclusion of the Wagner Electric Corporation as a unit of the new corporation through the acquisition of the outstanding securities and stocks of our corporation. These proposals are being carefully investigated with a view to determining whether any advantage would accrue to our stockholders under the terms proposed."

According to Laurence Wilder, who is handling the negotiations for the Brown-Boveri interests, William Cramp & Sons are also considering entering into the plan.

Muscle Shoals Bill Out of Conference

Underwood Measure with Several Material Amendments Now Awaits Final Action by Congress—Fertilizer Sections Are Rewritten

THE Underwood bill, which provides for the lease of the government property at Muscle Shoals to a private company for fifty years for the production of nitrates and power, or, failing a lessee, for its operation by a corporation appointed and controlled by the government (see ELECTRICAL WORLD for December 6, 1924, *et seq.*), has been reported out from the conference committee of the two houses of Congress, to which it was sent, as reported two weeks ago, by the House of Representatives. No vote on the measure had been taken in either house up to the time the ELECTRICAL WORLD went to press on Wednesday.

Many changes have been made in the bill as passed in the Senate, and it now contains some of the provisions of the McKenzie bill passed by the House last year, which would have leased the plant to Henry Ford. These changes are said to be quite satisfactory to Senator Underwood.

In their efforts to make the Muscle Shoals bill more acceptable to private enterprise, however, the conferees have botched the legislation to such an extent that there is talk as this is written of recommitting the bill to conference so that its obvious defects may be perfected.

By inserting a provision that the property must be leased as a whole the possibility of co-ordinating fertilizer manufacture and power production was precluded. Those in a position to distribute the power recognize that the Muscle Shoals project was undertaken for nitrogen production. They have no objection to allowing that activity to have the first call on such power as it needs. Since those needs for power could be anticipated a year or more in advance, the distributing interests would have time to take care of their own needs before they were called upon to turn the power over for fertilizer manufacture. Under the conditions of the conference bill, however, the power becomes subject to all the vicissitudes of the fertilizer company. Since this provision carries no benefit to any one concerned, there is a loss to understand why it was inserted.

THE PRESIDENT'S ATTITUDE

The conference bill contains two provisions thought to be very objectionable to the President. One is Dam No. 3 and the other is the requirement that the government renew the lease or purchase the property at the end of fifty years.

There is a very general feeling that a lessee will be found. This is some relief to administration officials, who look with great apprehension upon government manufacture of nitrogen to be distributed to the public.

The fertilizer industry sees in either private operation or the alternative of governmental operation the subsidizing of an activity which is to compete with its established business. That industry fully expects some one to come forward under the provisions of the leasing feature of the bill, when the lessee will receive the benefit of a subsidy which is figured at the equivalent of nearly $1,500,000 annually.

AMENDMENTS MADE

The conferees rewrote the fertilizer sections and inserted a new provision creating a farm board, to be appointed by the President, to keep tab on allociations and profit from the fertilizer output. This board would be composed of three representatives each of the American Farm Bureau Federation, the National Grange and the Farmers' Educational and Co-operative Union of America.

As it passed the Senate, the bill provided that farmers should have first call on the nitrates and that the lessee must sell to the farmers at the cost of production plus 1 per cent profit. The conference report fixes the price to the farmers at cost plus 8 per cent profit. Under such an arrangement, Senator Norris and other opponents of the bill say, nitrates will not be available to the farmers at a lower price than they can be obtained in the open market.

An amendment accepted by the Senate provided that water power should be available for distribution throughout the South after the amount necessary for fertilizer production had been employed. This amendment has been changed by the conferees to read that the distribution of the surplus water power would be made after the amount necessary for fertilizer "or other useful products" had been absorbed. The inclusion of "or other useful products" would have the effect of confining nearly all of the power to north Alabama; that is, keeping it in the main intermediate region of Muscle Shoals, where it could be used for the output of a large factory such as Mr. Ford might put into operation.

The time limit for the procurement of a lease before government operation would begin was extended from September 1, 1925, to December 1, 1925, and the rental on the property was fixed at 4 per cent annually of the cost of Dam No. 2—$50,000,000—less an amount chargeable to navigation and the costs of the locks, estimated at around $17,000,000.

The President would be authorized to use the $3,472,478 received by the government from the Alabama Power Company for the Gorgas steam power plant toward the cost of constructing Dam No. 3, which is authorized at an estimated cost of $27,000,000. When completed, this dam would be included in the provisions of the lease for Dam No. 2 and the other property.

At the end of the lease, or should the government find it necessary to take over the property, the bill provides that the government shall pay the lessee a fair valuation on only the fertilizer improvements, and not on any other construction or improvements for the production of other materials. If the government did not decide to take over the property, however, the lessee would have the preferred right to renew the lease under terms to be fixed by Congress.

Another new section inserted would require the operator to expend $50,000 annually for ten years toward experimentation in improved fertilizer processes.

Ferguson Tells of Success with Mercury Boiler

President Samuel Ferguson, in making his annual statement to stockholders of the Hartford Electric Light Company on Tuesday, said that experimental operation of the mercury boiler installed in the fall of 1923 had been remarkably successful and that the General Electric Company is now redesigning this apparatus to incorporate improvements which tests have demonstrated to be practicable. Efficiencies of the power stations have been so improved, President Ferguson said, that in the past year the company was able to generate twice as many kilowatt-hours from a ton of coal as was the case in 1914, thus partly offsetting the rise in coal prices.

Seattle Council Reduces Commercial Lighting Rates

The Seattle City Council on February 9 passed an ordinance reducing commercial lighting rates from 7 to 20 per cent, the reduction affecting stores, buildings, hotels and other downtown establishments.

By unanimous vote over Mayor Brown's veto the Council has also passed the bill providing for the appointment of three hydro-electric engineers to make an investigation of the Skagit River municipal hydro project. The engineers appointed are Joseph Jacobs, W. C. Morse and Sterling B. Hill.

Governor Trumbull to Address New Englanders

The Eastern and Western New England Associations of Electrical Inspectors will meet in joint session in the assembly hall of the Travelers Insurance Company, at Hartford, Conn., Monday, February 23, with Governor John H. Trumbull, president of the Trumbull Electric Company, as the principal guest. This meeting will mark the termination of the Western New England Association of Electrical Inspectors and the reorganization of the Eastern Association, made up of the membership of both.

Governor Trumbull will make an address in support of the thesis that "the acceptance of a uniform electrical ordinance would make universal interpretation of the National Electrical Code rules possible." Vice-president W. G. Cowles of the Travelers company, will speak on radio transmission by radio. E. Cabot of Boston, R. M. Hudson, chief of the division of simplified practice in the Department of Commerce at Washington; A. R. Small, vice-president of the Underwriters' Laboratories, New York, and C. A. Bates, electrical engineer, Bryant Electric Company, Bridgeport, Conn., will also speak.

Higher Voltages Coming

So Prophesies C. F. Harding of Purdue —Other Topics Before Wisconsin Electric Section

PROMINENT in the program of the Electric Section of the Wisconsin Utilities Association, which met at Milwaukee on February 5 and 6 with a good attendance, was the address of Prof. C. F. Harding, dean of electrical engineering of Purdue University, on the possibility of higher transmission voltages. Within the next ten years electric companies will be producing more than double the amount of electrical energy that is now generated, he said, and to bring it to the increasing millions of consumers will necessitate much longer transmission lines with undoubtedly much higher voltages than are now in use. This means not only new designs and methods of construction, but also new phenomena. Purdue University, Professor Harding said, is endeavoring to take the lead in specializing in research investigations of high transmission voltages. "Investigations so far show that large losses of energy occur in going to very high voltages," he asserted. "Lines of the future may have to use cables of much larger diameter or the distances between cables may have to be increased to such an extent that a different type of pole or tower line may result."

In opening the convention Chairman M. H. Frank of Fond du Lac said that electric power development in Wisconsin has completely overrun city and county boundary lines and in the last few years has changed from the localized service furnished by the individual plant to widespread interconnection of power systems rendering service to cities, villages and farms in vast areas. The efficiency of this state-wide interconnection is shown, he said, by the constantly decreasing amount of coal consumed to produce electricity. In 1924 fuel-burning electric plants consumed 770,608 tons of coal to generate 735,000,000 kw.-hr., while in 1923 these plants burned 862,271 tons of coal. Water-power plants produced 659,819,000 kw.-hr. During the past year an average of 2.15 lb. of coal was consumed to produce 1 kw.-hr. of electricity. A year ago 2.36 lb. was consumed, and ten years ago about 3.6 lb.

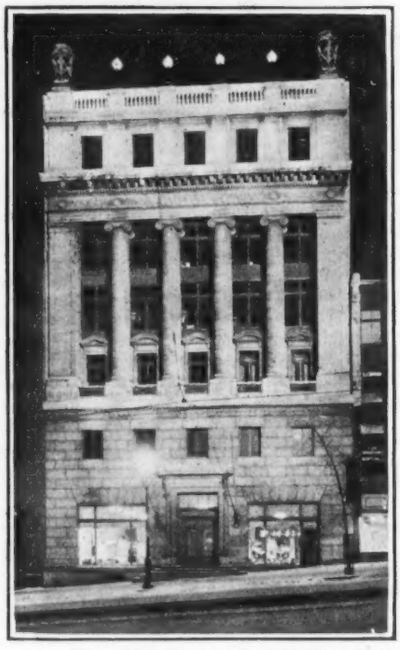
Rural Service

Farmers in Wisconsin are becoming increasingly anxious to secure electric service, and one of the chief reasons for that desire is the ambition to make their homes and homesteads more attractive to their children, said Prof. F. W. Duffee of the University of Wisconsin, director of the experimental rural line near Ripon. The final estimate of the value of any application of electricity, Professor Duffee went on, will take into account the following considerations: (1) Psychological effect—pride, self-respect, added cheerfulness; (2) convenience—better living conditions; (3) influence on production costs—saving time or labor in old processes, substituting new processes, increasing yield, avoiding waste; (4) improved quality of products; (5) effect on income—spare time or by-products used to produce revenue.

Commissioner C. B. Hayden told of recent developments in the Wisconsin Electric Safety Code, and there were practical discussions of switchboards and the inspection and replacement of meters. G. Y. Allen of the Westinghouse Electric & Manufacturing Company, speaking on radio problems, said that the advent of broadcasting has given power and light companies a further reason to give perfect service, for while most of the electric disturbances heard are inherent in the radio set itself, some of the interference is caused by defects on power or telephone lines. "Radio broadcasting," he said, "is increasing the consumption of electricity, because people are staying up later at night and are remaining home much more than they used to. It is good practice to help the radio user in eliminating trouble."

G. C. Neff, president of the association, commenting on Mr. Allen's talk, said that the interference caused by power or telephone lines gives these two industries a common problem and provides each with a wonderful opportunity to be of co-operative service to the radio user.

Floodlighting Embodying Ornamental Features



AN EXAMPLE of the practicability of display floodlighting of streets and buildings is provided at Albany by the Municipal Gas Company. Floodlamps on the roof of the building opposite throw their rays directly toward the building, while two floodlamps placed at an angle on the roof of the Ten Eyck Hotel further down the street prevent shadows being cast by the pillars. At the base of the pillars red lights inclosed in globes throw their rays upward, softening the effect. At the top of the building two "novagems" have been placed, one on each of the front corners, similar to those used in the Palace of Jewels at the San Francisco exposition. These vibrate with the wind, giving the effect of a fluctuation of light. At the top of the building between the "novagems" are four lamps giving a torchlight effect in which red, blue and white lights alternate. The Albany demonstration is said to be the first application of spectacular floodlighting of this sort to commercial buildings. Other business houses in Albany may soon employ the method.

Washington Public Ownership Bill Postponed

The Jacobs power bill, a successor to the defeated Bone and Reed bills, which was presented at the last session of the Washington State Legislature and, as already stated, was proposed for introduction at the present session, was not introduced and will not again come up until the adjourned session of the Legislature in November. The bill was drafted in the Tacoma city attorney's office. It allows cities to sell electric power outside their borders under certain restrictions, paying a 5 per cent tax on the gross proceeds of such sales. It is designed as a compromise between the Bone bill, which would have allowed tax-free sales, and the Reed bill, which would have taxed cities 5 per cent on all sales, both within and without their orders, if they sold any energy outside. The Jacobs measure provides that any city or town may sell to a municipal corporation or government agency which owns or operates a distribution system, or to any person, firm or corporation within 10 miles from the limits of the city owning the power, or within 3 miles of its transmission line; that any city or town may construct or acquire a distribution system, but not one in any other city or town, and that a 5 per cent tax shall be paid monthly on gross proceeds of sales outside the city limits, but this tax shall not be computed on exchanges of power through a tied-in system such as is now in effect between Seattle and Tacoma. A penalty of $20 per day is provided for failure to pay tax or provide information on which it may be computed.

Hoover Denies that Monopoly in Broadcasting Exists

In a review of the radio situation Secretary of Commerce Hoover said this week:

"There is no monopoly in radio broadcasting or any sign of it. Of the total of 563 stations in action not more than four belong to one concern.

"Some misunderstanding seems to have arisen, due to the failure of many people to read the White bill and the recommendation which I made to Congress for the postponement of legislation for the control of radio until next session. The law of 1912 secures to the government the fundamental control of radio, for it retains in its possession the channels through the air just as effectively as it does the channels of navigation upon our rivers. There can be no monopoly unless the government deliberately gives monopoly, and that would be parallel to the giving of exclusive right of navigation upon one of our rivers."

Sir Adam Beck Replies to Wyer Pamphlet

Says Ontario Commission Pays Heavy Taxes and that It Analyzes Costs in Detail—Questions Mr. Wyer's Competence to Pass Judgment

STRONG denial of alleged misstatements and misrepresentation in the recent Wyer-Walcott report issued by the Smithsonian Institution at Washington is made by Sir Adam Beck, chairman of the Ontario Hydro-Electric Power Commission, in a statement issued February 6. Sir Adam challenges the qualifications of Mr. Wyer to pass upon the extensive financial and engineering operations of the Hydro commission. He also severely censures Dr. Charles D. Walcott, executive head of the Smithsonian Institution, for giving unqualified indorsation to such a report.

Sir Adam says that Mr. Wyer is chiefly concerned with trying to explain why, notwithstanding the alleged superiority of the United States system under private ownership, the electric rates, and particularly the domestic rates, are so much lower in Canada than in the United States. He gives categorical denials to assertions advanced by Mr. Wyer that the Ontario utilities are not taxed and that domestic consumers are supplied at rates below cost, stating that the commission pays annually taxes amounting to hundreds of thousands of dollars and that costs are analyzed in detail each year to make sure that no class of consumers is charged either more or less than the cost of the service it receives.

"IGNORANCE," SAYS SIR ADAM

The charges in the report that $19,000,000 of the cost of power has not been included in the rates to consumers, thereby creating a deficit, are attributed by Sir Adam to ignorance. After dealing at considerable length with the various points in Mr. Wyer's report, Sir Adam says: "The so-called investigation on which Mr. Wyer based his report occupied only a few hours. This, seemingly, in the judgment of his superiors, has qualified him to pass upon the engineering operations of the Hydro-Electric Power Commission, the largest distributor of hydro-electric energy in the world."

Part of Sir Adam Beck's rebuttal follows:

"Mr. Wyer's alleged deficit of $19,147,014," says Sir Adam, "is composed of four items. Under the heading 'Summary of How Ontario Hydro-Electric System Has Failed to Pay Expenses,' Mr. Wyer states 'that the money that has been taken out of the provincial treasury instead of out of earnings is: (1) Subsidizing rural lines, from Section 24, $1,194,422; (2) general expenses, from Section 25, $2,245,900. The accrued deficits in sinking fund that have not been met out of earnings are: (3) Hydro-Electric Commission bonds, from Section 28, $7,749,646; (4) from money borrowings out of provincial treasury shown in Section 28, $7,957,046. Total, $19,147,014.'

"There is no more justification for assuming that these expenses (the first two items) should be charged as part of the cost of supplying power to the commission's customers in Ontario than there would be for assuming that expenses similarly incurred by, say, the United States Bureau of Standards or by the United States Geological Survey should be charged against the operations of the power companies of the United States.

"The other two items, which constitute over 80 per cent of the alleged $19,000,000 deficit, are, according to Mr. Wyer, sinking-fund shortages. This $15,706,692 sinking fund deficit, which exists only in Mr. Wyer's imagination, arose in three ways. In the first place, he ignored the fact that the various dates of maturity of certain bond issues of private power companies, which the commission assumed when their properties were purchased, have nothing to do with the periods over which the commission retires its capital by means of sinking funds. Such periods are fixed under the Power Commission act. In the second place, Mr. Wyer made an error of ten years in his calculation of his sinking fund on one issue, which error increased the imaginary deficit by $1,600,000. In the third place, Mr. Wyer ignorantly assumes that, somehow, the commission's large power developments were to commence repayment of their capital cost out of revenue some years before they were sufficiently far advanced in construction to earn any revenue at all.

"The greatest absurdity of his sinking-fund calculations is that Mr. Wyer elsewhere admits, and even stresses the fact, that the cost to the consumers should not include any provision for capital retirement at all. That is to say, according to Mr. Wyer's own definition of cost, the commission has from the consumers collected in its sinking-fund charges about $7,000,000 in excess of the cost. His subsequent conclusion that, by omitting to provide sinking-fund according to his arbitrary scale, the commission has accumulated a deficit of over $15,000,000 can only mean that Mr. Wyer, the Smithsonian Institution's associate mineral technologist, does not even know enough of elementary finance to comprehend the fact that the sole purpose of sinking funds is for capital retirement."

Special Hearing on Chicago Diversion to Be Held

Secretary of War Weeks has decided to hold a special hearing on February 16 on the application of the Sanitary District of Chicago for permission to divert 10,000 sec.-ft. of water from Lake Michigan. Meanwhile he has referred to the Attorney-General the dispute as to his legal authority as Secretary of War to allow the diversion of more than 4,157 sec.-ft. In recommending the granting of a permit the chief of the army engineers stipulated that certain conditions be met providing that Chicago shall adopt a comprehensive program of sewage treatment, shall pay part of the cost of compensating works to restore the level of the Great Lakes and shall meter 90 per cent of its water service. Secretary Weeks explained that fulfillment of these conditions would permit the ultimate reduction of the amount of water to be diverted to 4,400 sec.-ft.

Ontario Power Situation

Province Ready to Fight Dominion Over St. Lawrence Plans—Beck Alarmed About Shortage

DETERMINATION to fight unrelentingly any effort on the part of the Dominion government to deny the Province of Ontario its right to develop the St. Lawrence River for power purposes was expressed at a recent conference between the provincial Cabinet and Ontario Hydro-Electric officials. Following the conference Premier Ferguson announced that if the federal government approved the plans of the provincial Hydro Commission for the development of the St. Lawrence the Ontario government would immediately commence construction of a huge power plant on that river. Hydro engineers have estimated that the project will take at least four years to construct. It is the plan of Sir Adam Beck, chairman of the Ontario Hydro-Electric Commission, to link the St. Lawrence development with Chippawa and the other systems in the formation of a trans-province power system capable of meeting all domestic and industrial needs for many years.

Commenting on the lack of interest shown by some organizations in the development of the St. Lawrence power, Sir Adam Beck said: "I regret that the Canadian Manufacturers' Association and the Board of Trade of Toronto, which are so vitally affected, are taking no interest in this matter. If we cannot get on with the St. Lawrence, it means that we will have to go in for steam, with consequent higher rates, yet they sit coolly by. To develop a like amount of power by steam will require 9,000,000 tons of coal per annum from the United States and an expenditure of $40,000,000 to $50,000,000, which is equal to a capitalization of from six to eight billions."

Subsequently Sir Adam said that the reference of the whole matter to an advisory committee by the Ottawa government might mean "interminable delay" and protested that the commission was ready to go forward with a project to cost $12,000,000 or $15,000,000 that would not cost the Dominion administration a cent.

POWER SHORTAGE COMING

Faced with the worst power shortage in its history, which is due to beset the Niagara power zone in 1926, the Ontario Hydro-Electric Power Commission is planning drastic restrictions. Sir Adam Beck made this announcement at London, Ontario, a few days ago and added that the commission will discourage extensions of its distribution systems by municipalities.

A dispatch from Gowganda, northern Ontario, says that the power situation in the Gowganda district is steadily growing worse. The water in storage above the plant of the South Bay Power Company is nearing exhaustion.

Ohio's Big Undertakings

Total Expenditures of $75,000,000 to $95,000,000 in 1925 by a Dozen Companies

ELECTRIC light and power companies in Ohio are expected to raise new capital amounting to between $75,000,000 and $95,000,000 during 1925 for the purpose of continuing, improving and expanding their services. A large percentage of this amount will go into the building of new electric generating stations and high-tension transmission lines, as part of an interconnection project to link together almost all of the larger electric light and power companies of the state. Last year the electric light and power industry in Ohio raised $91,792,559, many millions being obtained by sale of securities to customers. Here are some of the bigger expenditures for 1925:

1. The Cleveland Electric Illuminating Company, Cleveland, $20,000,000, principally for the new superpower station at Avon.

2. The Union Gas & Electric Company, Cincinnati, $15,000,000 for work on its new Miami Fort power house, transmission lines, substations and the customary expenditures on the distribution system to provide for increased business.

3. The Ohio Public Service Company, operating in Lorain, Warren, Ashland, Alliance, Mansfield, Massillon and other Ohio communities, $2,830,000. Of this amount $1,585,000 will be spent for electric transmission and distribution facilities, $840,000 in connection with replacement projects, $210,000 on electric power stations and $100,000 for street and interurban railways.

4. The Northern Ohio Traction & Light Company, Akron, $2,000,000, one-half of which will go toward light and power extensions and one-half for street and interurban railway improvements.

5. The Dayton Power & Light Company, Dayton, $1,003,000, to enlarge and extend the company's distribution facilities for electric light and power and steam heat. This amount will be increased if there is a pronounced speeding up in industrial activities.

6. The Ohio Edison Company, Springfield, $550,000, of which $350,000 will go for power-plant turbines and switches and $195,000 for distribution lines.

7. The Lake Shore Electric Railway Company, Cleveland, $400,000, of which $250,000 will be used for light and power extensions.

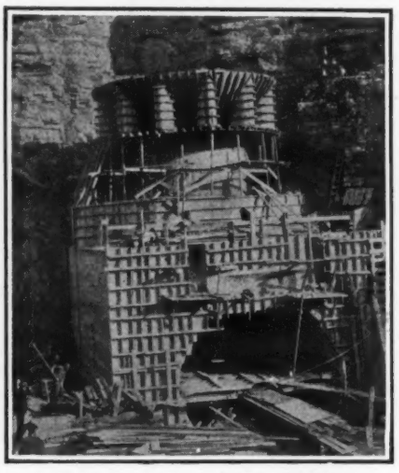
8. The Ohio Service Company, Coshocton and New Philadelphia, $280,000 for construction of three new power lines extending through parts of Tuscarawas, Holmes and Stark Counties. The route of the first line is from Newcomerstown, through Dover, Sugar Creek and Millersburg. The second extends from Dover to Sandyside and East Sparta. The third will be an additional line between New Philadelphia and Dover.

In addition to these companies, which have already announced the amount of new capital needed, such important companies as the Toledo Edison Company, the Columbus Rail, Light & Power Company, the Pennsylvania-Ohio Electric Company and others are now completing their plans for extending their services.

Dix River Dam in Kentucky Nearly Completed

The Dix River dam of the Kentucky Utilities Company is now more than 80 per cent complete and contains 1,700,000 yd. of loose rock fill with reinforced-concrete upstream face. The dam is built in the gorge of the Dix River, about 15 miles north of Danville, Ky., and about 3 miles above the mouth of the Dix, where it flows into the Kentucky River at High Bridge. The height of the dam will be 270 ft. and its length about 1,000 ft., and it will afford a maximum operating head of 235 ft., which will be drawn down during dry periods, with a probable minimum head of 165 ft. The reservoir in the upper 70 ft. will provide about 24,000,000 kw.-hr.

The river is being diverted during construction through a horseshoe-shaped tunnel, 24 ft. wide and 24 ft. high, which is concrete-lined and will serve after completion as a pressure tunnel for the turbine supply water. At the



BUILDING THE DIX RIVER DAM

upper end of this tunnel there will be an intake tower to control the admission of water by means of a cylindrical gate 17 ft. in diameter, which is hoisted by a hydraulic pressure plunger at the top of the tower. After use for diversion the tunnel will be closed at the lower end by a concrete plug through which three steel-plate penstocks 8 ft. in diameter will pass to provide water for the three power units. Another such steel-plate penstock will be used for blow-off for emptying the reservoir. The control of the water supply of each unit is handled by means of a Larner-Johnson valve installed immediately ahead of the scroll cases. Three units of 7,500 kw. each are now being installed by the Allis-Chalmers Manufacturing Company. The hydraulic turbine units, rated at 300 r.p.m., were built by William Cramp & Sons Ship & Engine Building Company and are provided with cast-steel scroll cases.

The project also requires the building of two highway bridges. L. F. Harza is consulting engineer.

Wisconsin's 1925 Program

From Fourteen to Fifteen Million Dollars to Be Expended by Central Stations

WISCONSIN electric light and power companies will, according to John N. Cadby, executive secretary of the Wisconsin Utilities Association, have to spend from fourteen to fifteen million dollars in 1925 to keep abreast of the growing demand. This expenditure will be financed by the issue of new securities, largely to customers of the utility companies. Chief among the expansion programs to be carried out in all sections of the state are the following:

The Milwaukee Electric Railway & Light Company will spend for extensions and improvements to its electric generating, transmission and distribution properties a sum reaching fully $5,000,000.

The Wisconsin Public Service Corporation will require approximately $1,740,000 for extensions and improvements to its electric properties, supplying light and power service to Green Bay, Oshkosh, Marinette and sixty other communities in northeastern Wisconsin. Outstanding improvements include the building of a new automatic hydro-electric power plant at Sandstone Rapids to cost $800,000, installation of additional generating units at its Oshkosh and Manitowoc steam plants to cost $120,000 and $50,000 respectively, a new seventy-five-thousand-dollar substation at Marinette and electric line extensions in Green Bay, Oshkosh, Marinette, Manitowoc, Sturgeon Bay, Chilton, Oconto and Depree.

To satisfy Madison's growing power, light and heat requirements, the Madison Gas & Electric Company has outlined an improvement program requiring an expenditure of $857,400. A new electric generating unit of 10,000 kw. capacity will be added to its present facilities to cost about $766,000, and $82,500 will be spent for equipment to enlarge and extend its electric distribution department.

Considerable extensions and improvements to its electric generating, transmission and distribution properties, involving a sum totaling approximately $1,502,824, will be made by the Wisconsin Power & Light Company during the year to maintain and enlarge its power and light service in the 151 communities it serves in south central Wisconsin.

Approximately $1,000,000 will be spent by the Lake Superior District Power Company for new construction and extensions to its electric properties to keep pace with the development of Ashland, Hurley and nineteen other communities in northern Wisconsin.

Hydro-Electric Progress Goes On in Mexico

Plans are said to be under way for the construction of a hydro-electric plant in the Sierra Madres, near the historic mining town of San Dimas, by the Mexican Candelaria Mining Company. The plant is to be built for an ultimate capacity of 250,000 hp., and it is expected that one-half of this

amount of electrical energy will be available within the next eighteen months and the remainder within three years. The company, which has been operating in that part of Mexico for many years, owns mines, timber lands, plantations and other property in the States of Durango and Sinaloa. It is composed of Americans and its president is Charles Dunphy of San Francisco, Cal. The water supply for operating the hydro-electric plant will be obtained by damming a mountain stream. From the generating plant a system of transmission lines will be built to the mining districts of Durango and Sinaloa and into the borders of the States of Sonora and Jalisco, according to an authorized announcement. Power will also be eventually transmitted to the Pacific port of Mazatlan and other towns within a radius of 150 miles of the hydro-electric plant.

It is expected that the furnishing of cheap electric power to mines and manufacturing plants within the territory to be reached by the transmission lines from this hydro-electric plant will bring about a development of these industries similar to that which has been accomplished in the States of Chihuahua, Mexico, Guanajuato, Michoacan and parts of Jalisco by other large hydro-electric companies.

New Projects Before Federal Power Commission

The Eastern States Development Company has applied to the Federal Power Commission for a preliminary permit covering a project on New River and Fisher River at the boundary line between Virginia and North Carolina. It is proposed to construct a dam in New River just below the mouth of Meadow Creek, near Oldtown, in Virginia. A reservoir will be created which will extend 20 miles up stream and will completely regulate New River. A tunnel from Meadow Creek will connect with the power house on the headwaters of Fisher River, which is a tributary of the Adkin. Four dams are to be constructed in Fisher River, creating continuous reservoirs above the lower dam, which will be put in 3 miles north of Crutchfield, N. C. There will be a power house at each dam. No estimate of the power to be developed was submitted.

The California Oregon Power Company has applied for a preliminary permit covering a project on Clearwater River 50 miles east of Roseburg, in Douglas County, Ore. The dam will create a storage reservoir 6 miles long. No estimates have been made as yet as to the amount of power which can be developed.

The Buchan & Heinen Packing Company of Seattle has applied for a license to cover a partly constructed project at Port Armstrong on Baranof Island, Alaska.

An application for license has been received from the Inland Power & Light Company covering a transmission line in Franklin County, Wash.

Fred. B. Allard has applied for a preliminary permit covering an installation on Foss River in King County, Wash. The site is a hundred miles above Seattle. The power is intended for public utility use, but no estimate of the amount to be developed was submitted.

Arthur Moa has applied for a preliminary permit covering a project on Fish Creek at a point 6 miles from Hyder, Alaska. The current is intended for general use in Hyder and to supply power at mines in the vicinity.

Holyoke Dispute Comes Before State Regulating Body

The Massachusetts Department of Public Utilities opened a hearing on February 5 in Holyoke on a petition of the Turners Falls Power & Electric Company for leave to enter Holyoke to connect with the Berkshire Street power plant, recently purchased from the Holyoke Street Railway Company under a contract by which the power company agrees to furnish energy to operate the railway system. W. Rodman Peabody, attorney and vice-president of the Turners Falls company, said the public would be better served by his company as it had the necessary energy to take care of the load represented by the railway system. He explained that the railway company's lines were already served with energy by his company at points in Chicopee and Amherst and also from Mount Tom Junction, where a connection with Mountain Park gave energy for lighting and power.

A map exhibited to the commission showed that it is necessary to cross territory of the Holyoke Water Power Company for a distance of 50 ft. to make the desired connection. Mr. Peabody said that the purchase of the somewhat antiquated power house of the railway company for $400,000 was by a contract separate from that covering the sale of energy. He said the company had merely sought to purchase the railway power house at the lowest possible figure.

Examination of Mr. Peabody brought out the point that several years ago negotiations were begun for the consolidation of the two power companies and that last spring a conference was held looking to a physical connection between the two systems, but both attempts were fruitless.

Robert E. Barrett, president of the Holyoke Water Power Company, opposing the Turners Falls company's entrance, said that his company had planned to supply the needs of the Holyoke Street Railway Company and it was not until after it had built a substation planned with that end in view that he learned of the company's purpose to get energy from a different quarter. He said his company stood ready to match the Turners Falls contract in the matter of rates and service. Asked why the water-power company opposed the plan of the Turners Falls company, he replied: "For one reason, because, once ensconced here, they could make connections with many Holyoke plants without going outside private lands."

Fred L. Hunt, chief engineer of the Turners Falls company, admitted that there are three other possible ways by which energy could be conveyed from the Turners Falls system to the Berkshire Street Station. The hearing was continued until February 20.

Advocate Carillon Plant

Senator Miles and Other Canadian Promoters Point Out Gain from Exportation Policy

A LETTER recently circulated among members of the Quebec Legislature and bearing among other signatures that of Henry Miles, a Canadian Senator, dwells on the advantages of the development of electric power at the Dominion-government-owned dam at Carillon Falls, on the Ottawa River, for exportation to the United States. Strong Montreal interests are said to be eager to develop this power, rated at a maximum of 400,000 hp.; to retain 100,000 hp. for home consumption, and to transmit the rest across the border for the benefit of New England industries and power companies. The cost of the enterprise is put at $40,000,000, and it is asserted that the capital is forthcoming in the United States. It would be many years, the letter says, before the capital could be raised or the power used in Canada.

The Carillon development, it is further contended in the letter, should be undertaken in one single definite operation by reason of the largeness of the river, since the cost of construction of a gradual and periodical development would make the project financially impossible. The undertaking is said to mean 14-ft. navigation on the Ottawa River to Ottawa and Hull, from the St. Lawrence, without the expenditure of a single dollar on the part of the Dominion government. The quantity of power reserved for Canada will obviate the necessity of buying a million and a half tons of coal a year in the United States. The construction of the plant would furnish employment to more than two thousand men during two or three years at Point Fortune and Carillon. It would mean, also, its Canadian advocates maintain, more employment in cement, steel and other factories which would supply the materials.

Senator Miles, who is president of the National Hydro-Electric Company, says further:

"The American manufacturers who want our power sent to them, and who are directly or indirectly those who have joined in the contracts framed for the exportation of the surplus power produced at Carillon, are all old, established business organizations and industries. If we withhold the power, is it possible to conceive that they would move their plants and arrange to conduct their operations in Canada? Such a course can fairly be regarded as impossible. There is nothing in the allegation as to its being unpatriotic to export hydro-electric power, of which we have 14,000,000 hp. still undeveloped in the Province of Quebec alone. One might ask how long it will take if the American industries were to decide to rush in for cheap power to utilize any appreciable quantity of this great development on the spot? This question is pertinent because Montreal has reached a consumption of only about 250,000 hp. in forty or fifty years."

Briefer News

Technical Meetings of the N. E. L. A. at Cleveland.—The committee and executive meetings of the National Electric Light Association held at Cleveland on February 4 to 6 brought together three hundred members. There was no specially outstanding feature. Reports and discussions occupied the three days, and much profit was evident.

Ontario Hydro to Spend $12,000,000 This Year.—Announcement has been made by F. A. Gaby, chief engineer of the Ontario Hydro-Electric Power Commission, that an expenditure of $12,000,000 in transmission lines, generating plants and transmission stations is called for in the 1925 program of the commission.

Columbus and Tupelo (Miss.) Plants Connected.—The high-tension transmission line in Mississippi connecting the Columbus and Tupelo plants of the Mississippi Power & Light Company has been completed and connected with the Columbus plant, and it is planned to erect a steam plant at Columbus. Power will be furnished for towns between the two cities also.

Illinois Power & Light Buys Nebraska Property.—Announcement is made by the Illinois Power & Light Corporation of the purchase, through the Omaha & Lincoln Railway & Light Company, a subsidiary, of the Ashland (Neb.) Light, Power & Mill Company. The property comprises a hydro-electric plant, a dam and water-power rights, a central steam plant and a widespread network of transmission lines.

Brazil's Big New Hydro-Electric Plant.—A few weeks ago, Consul Bradford reports, the new hydro-electric generating plant on the Parahyba River at Ilha dos Pombos in the State of Rio de Janeiro went into service. The plant was constructed by the Brazilian Hydro-Electric Company, Ltd., and is reported to be the largest in South America. It will transmit 155,000 kw. over a 92-mile line to Rio de Janeiro.

Canadian Power Company and Hydro Commission Sued for Lowering Lake Levels.—John Stirret of Port Arthur, Ontario, who owns extensive interests in the Dog Lake districts of northwestern Ontario, has issued a writ in Toronto claiming damage to the extent of $476,535 from the Kaministiqua Power Company and the Ontario Hydro-Electric Power Commission in connection with alleged damage to the levels of Big and Little Dog lakes.

Spotlamps Protect Traffic Policemen.—Spotlamps have been installed by the Cleveland Electric Illuminating Company for the protection of traffic policemen during night duty. Where feasible, the spotlamps are suspended from steel messengers attached to poles at opposite corners of the intersection. Ninety of them have been installed so far.

Ohio Power Takes Over Kenton Central Station.—The Ohio Power Company has taken over control of the property of the Hardin-Wyandot Lighting Company at Kenton, Ohio. Earl D. Chapman and Louis Lonsway of Tiffin, Harry Armstrong and C. S. Browne of Newark and Fred Morrison of Fostoria were elected directors.

El Paso Has New Street-Lighting System.—A new street-lighting system for the business district of El Paso, Tex., consisting of 124 ornamental posts and costing $65,000, was dedicated on December 24, 1924, with a public celebration. The posts are 16 ft. in height and are staggered. The lights used are of 1,300 cp. rating. Service is supplied by the El Paso Electric Railway Company.

Towaliga Falls Power Company Changes Hands.—The Towaliga Falls Power Company of Griffin, Ga., has been sold to the Georgia Hydro-Electric Company, headed by R. J. McClelland of New York and Wilbur Barnes of Griffin. The price, it is understood, was $470,000. The plant is one of the oldest hydro-electric installations in the South, having been in operation for twenty years. It will now be tied in with neighboring high-tension lines.

Zanesville Experiments Successfully with Philo Power.—Industrial power users at Zanesville, Ohio, are reported as much pleased over the results of an experiment made by the Columbus, Newark & Zanesville Electric Railway Company. Since the first of the year the company has been obtaining all of its power from the Ohio Power Company's plant at Philo, with the view of finding out if at any time all power for lighting and commercial use for Zanesville might be procured from the Ohio Power lines.

Projected Development on Trinity River, California.—A preliminary step in a six-million-dollar hydro-electric power project was taken last week when a group of Los Angeles men—Charles A. Giffen, H. Knapp, O. E. Freeman, P. W. Porter and R. V. Pearsall—filed with the State Division of Water Rights a petition for a permit to divert water from the forks of the Trinity River. The project includes the construction of a reservoir with a capacity of 170,000 acre-feet of water. The power is to be used for mining, pumping and industrial purposes.

Public Utilities Course at Indiana University. — Indiana University, Bloomington, Ind., is to have a course in public utilities, according to Dean W. A. Rawles of the School of Commerce and Finance of the university. Among the lecturers will be Samuel R. Artman, chairman of the Indiana Public Service Commission, and Martin J. Insull, president Middle West Utilities Company, Chicago.

Revocable-Permit Bill Passes Oklahoma Lower House.—The House bill to authorize public utility companies at their option to surrender their franchises and take out a revocable permit issued by the State Corporation Commission, giving them the right to continue to operate unless such permit is revoked by the state, has passed the lower house of the Oklahoma Legislature by vote of fifty-five to thirty-two. The bill was then sent to the Senate and referred to the public service corporation committee of that body.

Fatal Accident at Baker River Project.—Five men were killed and three injured on the Baker River power project of the Puget Sound Power & Light Company, Seattle, under construction near Concrete, Wash., by Stone & Webster, Inc., when a landslide in the canyon occurred on January 23. The accident was caused by excessive rains just prior to that date. The slide deluged and demolished a small derrick-hoist house where the eight men were eating lunch.

Columbus (Ohio) Company Under New Control.—Control of the Columbus (Ohio) Railway, Power & Light Company now rests with the Hulswit-Eaton group, representing the Continental Gas & Electric Company of Omaha, Neb., most of whose officers reside in Cleveland. New directors of the Columbus company include Cyrus S. Eaton and Thomas H. Jones Cleveland, and Frank T. Hulswit, Chicago. Charles L. Kurtz, former president, has retired from his position and directorship.

Completion of Interconnection Between Three Illinois and Indiana Systems.—The Chicago Heights-Joliet section of the 132,000-volt line on privately owned right-of-way which will connect the Public Service Company generating station No. 9 with the Calumet generating station of the Commonwealth Edison Company has been completed. This line also connects with the Northern Indiana Gas & Electric Company at the state line, and the portion of the line between Chicago Heights and the Indiana state line has also been completed, thus bringing into service an important development in Middle State interconnection. Service from the "superpower" substation of the Calumet Power Company at Aetna, just east of Gary, Ind., from which six 33,000-volt lines radiate, began on February 12

Wisconsin Inspectors Arrange Program.—For their fourth annual meeting, to be held at Milwaukee on February 17-19, the Wisconsin Chapter of Electrical Inspectors has arranged a program including, in addition to committee reports, addresses by C. W. Abbott on "Romex Non-Metallic Armored Cable," William Haig on "Manufacturing Safety," Frank Frey, Jr., on "The Code, the Inspector, the Executive," C. W. Babcock on "Electrical State Licensing," W. S. Boyd on "Some Practicable Forms of Publicity for Electrical Inspectors," Judge G. A. Shaughnessy on "Enforcement, Violations and Penalties of the Electrical Laws," and Dr. T. C. Cornell on "Electrical Therapeutics."

Three Hundred and Thirty Tons of Steel and Iron Scrapped as Electricity Comes In.—"First-class junk" weighing 660,000 lb. is being disposed of for about the cost of removal in order that the Yorkville Ice Sales Corporation of

New York City may change its plant over to electrical operation, energy to be furnished by the United Electric Light & Power Company. This steel and iron scrap represents three steam units that served the plant for more than twenty-five years. In their place there will be set up three duplex electrical ice-making machines at an expense of more than $100,000. They will be able to produce 400 tons a day, with an initial installation rated at 1,700 hp., but it is expected that installation and output will soon be increased.

Great Western Power Offices to Be Moved. — The San Francisco district offices of the Great Western Power Company will be moved to 435 Sutter Street as soon as remodeling of the building recently purchased at that location is completed. The company's division offices have been established at 347 Grant Avenue for many years, but growth of business has necessitated a move. The executive and legal offices of the company were moved from 530 Bush Street, to a new suite of offices in the Standard Oil building on February 1. General offices, including those of department heads, will remain at 530 Bush Street.

Blue Ridge Power Company to Get Energy from Pleasure Resort Lake.— A dam and hydro-electric plant on the Rocky Broad River at Chimney Rock, N. C., a projected pleasure resort, will probably be started in the early spring, following a contract with the Blue Ridge Power Company whereby the latter will buy 13,500,000 kw.-hr. a year from this plant. An interesting feature is that the Lake Lure plant, as it will be known, is to be operated from the Turner plant of the Blue Ridge Power Company through electrical control and that an automatic governor will maintain at all times the level of the lake.

Fort Wayne's New Municipal Hydro Plant. — In addition to installing a 4,000-kw. steam turbo-generator, the Fort Wayne (Ind.) Municipal Electric Light & Power Plant reports that in 1924 it installed or got ready for installation a 320-kw. generator to be operated by a waterwheel at the Maumee River dam. According to the municipal authorities, this hydro-electric plant is costing only $60,000 and will develop 1,500,000 kw.-hr. annually, on which there will be a profit of 1 cent a kilowatt-hour, or $15,000 a year. The plant is to be operated automatically. The lighting rate charged by the Fort Wayne municipal plant is 6 cents a kilowatt-hour, and it has an application pending before the Public Service Commission for a reduction to 5 cents.

Washington Water Power Company Will Duplicate Railroad Circuit.—The new 110,000-volt power line built by the Washington Water Power Company last spring from Taunton, on the Chicago, Milwaukee & St. Paul Railway, to Neppel, in Grant County, 26 miles, where it connects with the new Grant County transmission system, has been cut in. At Taunton the line just finished makes a contact with the 110,000-volt Intermountain line supplying the railroad. Eventually the Taunton-Neppel line will form part of a through 110,000-volt line now being built from the Long Lake power plant to Stratford, 86 miles. At Stratford the new line will merge into a present 60,000-volt line running to Neppel. This line will be rewired and insulated for 110,000 volts, making a complete new 110,000-volt circuit from Long Lake to Taunton for a duplicate power supply for the railroad.

Winnipeg Hydro Commission Halts Its Campaign to Install Electric Ranges. —The plan for increasing consumption of electrical energy by furnishing ranges without cost but with a double charge for energy used, which, as told in the ELECTRICAL WORLD for October 25, 1924 (page 910), was tried by the Hydro-Electric System of Winnipeg, Manitoba, has been discontinued at least temporarily, the City Council having been convinced that it meant an annual loss to the city. The plan was intended especially for apartment houses, where a large number of gas ranges fed by the competing Winnipeg Electric Company, which monopolizes the city's gas business, were replaced by electric stoves.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, January 3, page 76.]

Wisconsin Chapter of Electrical Inspectors—Pfister Hotel, Milwaukee, Feb. 17-19. A. C. Schultz, Milwaukee.

Oklahoma Utilities Association—Oklahoma City, March 10-12. E. F. McKay, Oklahoma City.

Illinois State Electric Association—Hotel Sherman, Chicago, March 18-19. R. V. Prather, Illinois Mine Workers' Bldg., Springfield, Ill.

American Institute of Electrical Engineers—St. Louis, April 13-17; Saratoga, N. Y., June 22-26. F. L. Hutchinson, 33 West 39th St., New York.

Southwestern Division, N. E. L. A.—Eastman Hotel, Hot Springs, Ark., April 21-24. S. J. Ballinger, San Antonio Public Service Co., San Antonio, Tex.

American Electrochemical Society—Niagara Falls, N. Y., April 23-25. C. G. Fink, Columbia University, New York.

Southwestern Public Service Association—Rice Hotel, Houston, Tex., May 5-8. E. N. Willis, 403 Slaughter Bldg., Dallas.

American Institute of Electrical Engineers, — Regional conventions, Swampscott, Mass., May 7-9; Cleveland, May 22-23.

Electrical Manufacturers' Club—Hot Springs, Va., May 19-22. S. B. Belden, Jeffrey Manufacturing Co., Columbus, Ohio.

Middle West Division, N. E. L. A.—Hotel Fontenelle, Omaha, Neb., May 20-22. H. M. Davis, Fraternity Building, Lincoln, Neb.

Electric Power Club—Hot Springs, Va., May 25-28. S. N. Clarkson, B. F. Keith Bldg., Cleveland, Ohio.

Electrical Supply Jobbers' Association —Hot Springs, Va., June 2-5. Franklin Overbagh, 411 S. Clinton St., Chicago.

American Association of Engineers—Orlando, Fla., June 2-5. C. E. Drayer, 63 East Adams Street, Chicago.

Associated Manufacturers of Electrical Supplies — The Homestead, Hot Springs, Va., June 8-12. F. Nicholas, 30 East 42d St., New York.

National Electric Light Association—San Francisco, June 15-19. M. H. Aylesworth, 29 West 39th St., New York.

Augusta-Aiken and Georgia Railway & Power Systems to Be Connected.— By the construction of a high-tension transmission line from Toccoa to Augusta, Ga., just determined upon by the Augusta-Aiken Railway & Electric Corporation, in conjunction with the Georgia Railway & Power Company, Augusta, hitherto insufficiently served, expects to receive an ample all-year supply of hydro-electric energy from the Tugalo station of the Georgia Railway & Power Company, which is tied in with the interconnected systems of the Southeast. About 100 miles of transmission line is to be erected, and in addition to Augusta a number of places will be served in Georgia and in South Carolina. The expenditure contemplated is put at $1,500,000, and it is hoped to have the line in operation next September.

Plan to Double Capacity of Valmont Plant.—To meet the expected demand for electric power in Colorado cities and from the Moffat Tunnel, when it is completed and electrified, the Public Service Company of Colorado is planning to double the capacity of the present power plant at Valmont, near Boulder, by adding a second unit to cost approximately $750,000, according to H. H. Kerr, electrical superintendent of the company. A main dam 3,500 ft. long with five subsidiary dams is planned. Construction on both projects, which will cost together $1,100,000, will be started in the present year, probably by late summer or fall, according to Mr. Kerr. With the completion of the second unit the Valmont plant will have a capacity of 50,000 kw. A third unit will be added to the Valmont plant in 1928 or 1929, if present plans are carried out. Construction of this unit, however, may hinge on whether or not the entire Moffat railroad is electrified between Denver and Tabernash.

Harnessing the Geysers. — General Electric Company engineers who have been experimenting with the idea of obtaining power from California geysers report that in Sonoma County natural steam, roaring up through 200 ft. of 8-in. iron piping, has been driving a 35-kw. turbo-generator for several months. The tests revealed that this natural steam is 99 per cent pure and issues at a steady flow and a constant pressure of 60 to 70 lb. with a temperature at the outlet nozzles of 335 deg. F. Of plans to serve Healdsburg, a town of 2,000 population, about 15 miles from Geysers Canyon, the site of the wells, the General Electric engineers reported that electricity generated by natural steam would cost a half to a third as much as a small steam or hydro-electric plant. Much experimenting will be necessary, however, before an entirely satisfactory installation will be possible at the geysers. Engineers are now said to be working to design a turbo-generator which will not be affected by the small percentage of gases found in the steam.

Men of the Industry

Colonel Harvey H. Hannah has been elected chairman of the Tennessee Railroad and Utilities Commission. As the member from east Tennessee he has served on the utility commission since the death of B. A. Enloe. Colonel Hannah was an officer in the Spanish-American War and has been prominent in the politics of the state.

I. M. McCray, assistant general manager of the East Penn Electric Company, Pottsville, Pa., has resigned.

A. C. Marshall, vice-president of the Detroit Edison Company, has been appointed by Mayor John W. Smith as chairman of the special commission of five engineers to investigate conditions and plan a sewage-disposal system for the city of Detroit.

E. B. Wilson, formerly connected with the Middlesborough office of the Kentucky Utilities Company, has been transferred to the company's Harlan branch in the capacity of manager, succeeding L. K. Hayes, who has assumed new duties in Pineville.

John C. Hector, formerly assistant treasurer of the Puget Sound Power & Light Company at Bellingham, Wash., a Stone & Webster property, is now connected with the State Securities Corporation of Chicago in the capacity of secretary-treasurer.

Samuel Kahn, vice-president and general manager of the Western States Gas & Electric Company, Stockton, Cal., was recently appointed a director of the Standard Gas & Electric Company, the holding company under which many of the Byllesby properties are controlled.

H. W. Flashman has been appointed managing director of the Australian Westinghouse Electric Company, Ltd., of Sydney. Mr. Flashman is an Australian and, following his education in that Commonwealth and in America, spent eleven years in electrical engineering works in the United States, including those of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa.

E. P. Lovejoy, Jr., of the news bureau of the General Electric Company, has been transferred from Schenectady to New York City to represent the publicity department at the executive offices of the company, according to a recent announcement by Martin P. Rice, manager of the publicity department.

M. H. Montross has been selected to take charge of the Wisconsin Valley Electric Company's electric and gas generating and distributing properties at Stevens Point to succeed A. H. Sikes, who recently resigned to take up new work with the Illinois Light & Power Company. Before his connection in Stevens Point Mr. Montross was superintendent in charge of the Gary Heat, Light & Water Company's properties at Gary, Ind.

L. C. Bullington, formerly assistant manager of the power department of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa., has been appointed manager of the Cincinnati district office. He succeeds James A. Brett, who died recently in Bermuda. Mr. Bullington goes to Cincinnati after an extended connection with the Westinghouse interests. He was for a long time Southeastern district manager of the Westinghouse Machine Company with headquarters at Atlanta, and at the time of its merger with the Westinghouse Electric & Manufacturing Company Mr. Bullington became division manager at Atlanta. He was later transferred to Buffalo and subsequently to East Pittsburgh.

A. F. Townsend Operating Head of Western United Corporation

A. F. Townsend, general manager of the Eastern Texas Electric Company, Beaumont, Tex., since 1916, has been appointed operating vice-president of the

A. F. TOWNSEND

Western United Corporation, Aurora, Ill. Stone & Webster, Inc., have, as announced in the ELECTRICAL WORLD for January 24, been retained as executive managers of the Western United Corporation. Mr. Townsend's appointment as operating vice-president comes as a recognition of his ability and achievements during twenty-seven years of service with Stone & Webster, Inc.

Prior to his eight years as head of the gas and electric properties of Beaumont, Tex., Mr. Townsend had been in charge of Stone & Webster interests in Porto Rico. For eight years prior to this Mr. Townsend had been in charge of various Stone & Webster properties with headquarters at Woonsocket, R. I. During this period Mr. Townsend served as a director and during 1913 as president of the New England Section, National Electric Light Association. Prior to his Rhode Island residence, Mr. Townsend managed the Cape Breton Electric Company, Sydney, N. S.; the Lowell Electric Corporation, Lowell, Mass., and the Lewiston & Auburn Electric Light Company of Maine. Mr. Townsend has been a leader in civic affairs in Beaumont, Tex., and his leaving was the occasion for numerous resolutions and testimonials by civic bodies of appreciation of his services to the community.

B. P. Baily, for the past five years district manager of the Astoria office of the Pacific Power & Light Company, has been appointed district manager at Yakima to succeed George C. Sawyer.

W. R. Pender, electrical consulting engineer, has established offices at Houston, Tex., and will specialize in power plant and industrial electrical engineering work.

J. C. De Conly, formerly engineer of construction for the S. & H. Electric Service Company, Alhambra, Cal., has opened offices in Los Angeles, where he will practice consulting engineering.

Colin McDonald, associated with the Dubuque Electric Company for fifteen years and who for several years has served as assistant treasurer, has resigned his position to become treasurer of the recently organized Michigan Electric Power Company, with headquarters at Bad Axe.

Hunter T. Wilson has resigned as district manager of the Iowa Southern Utilities Company, Chariton, Iowa, effective March 1, and will enter business for himself. He has been with the company and its predecessor for seven years and for fifteen years previous engaged in similar work in Illinois and Indiana.

Fraser S. Keith has joined the Shawinigan Water & Power Company as manager of a new department known as the department of development. Mr. Keith is well known in Canada as managing editor of the *Engineering Journal* and general secretary of the Engineering Institute, with which he will continue to be associated in an advisory capacity.

W. G. Church, formerly district manager of the East Texas Public Service Company at Winnsboro, has been transferred to Mineola in the capacity of manager of the company's properties there.

Paul M. Beattie, formerly associated with the engineering department of the Worthington Pump & Machinery Corporation, Harrison, N. J., has recently joined the New York sales force of the Industrial Controller Company, Milwaukee. Mr. Beattie is a graduate of Purdue University.

Arthur Woodman has been placed in charge of the engineering department of the Public Service Company of Northern Illinois at Evanston to succeed W. H. Knutz, recently transferred to Hammond, Ind.

Edward J. Nally, who retired last December from active service as managing director of international relations of the Radio Corporation of America, is at present in Europe seeking a long-needed rest. A pioneer in all branches of electrical communication, Mr. Nally at the time of his retirement had rounded out fifty years of service in the telegraph, telephone and radio fields. Starting with the Western Union, he later joined the Postal Telegraph Cable Company, resigning in 1913 as first vice-president and general manager to become vice-president and general manager of the Marconi Wireless Telegraph Company of America. Upon the merger in 1919 of the American Marconi interests and the radio activities of the General Electric Company and the American Telephone &

Telegraph Company and its subsidiary, the Western Electric Company, into the Radio Corporation of America, Mr. Nally was chosen president. It was two years ago that he assumed the duties of managing director of international relations. He will continue as a member of the board.

J. V. Anderson, formerly district manager of the North Missouri Power Company, Brookfield, Mo., has become operating engineer of the Missouri Power & Light Company, Mexico, Mo.

Stewart Wright has joined the Massillon force of the Ohio Public Service Company in the capacity of power engineer, succeeding Fred Ellington.

William R. La Motte, formerly assistant chief engineer of the Marion station of the Public Service Electric & Gas Company at Jersey City, has been appointed chief engineer to succeed Marion Penn, recently transferred to Kearny.

R. C. Greer, resident engineer of the East Penn Electric Company, Pottsville, Pa., has resigned to become connected with the Portsmouth **(N. H.)** Power Company.

E. R. Smith, formerly connected with the Mansfield division of the Ohio Public Service Company, has been transferred to the Sandusky division as distribution engineer.

E. T. Pfohl, formerly connected with the Auburn (N. Y.) office of the Empire Gas & Electric Company, has been appointed manager of the company's office at Palmyra. Mr. Pfohl has been identified with the Empire company for the past six years.

Edwin H. Tyson, formerly connected with the Allentown office of the Pennsylvania Power & Light Company, has been appointed superintendent of the meter department of that company, with headquarters at Hazleton, Pa.

Roderick McRae, for many years associated with the Pacific Power & Light Company, Portland, Ore., has recently been appointed electrical superintendent of the Lewiston (Idaho) district. The properties of the Washington-Idaho Water, Light & Power Company at Lewiston, recently transferred to the Inland Power & Light Company, will be operated by the Portland utility.

Benjamin F. Romine, formerly of Frederick, Md., and for seven years associated with the Potomac Light & Power Company at Martinsburg, W. Va., has been named superintendent of the Berkeley Springs branch of the Northern Virginia Power Company. Both companies are subsidiaries of the Potomac Edison Company. Mr. Romine is succeeding D. E. Stultz.

James Goldsborough, who for the past two years has been in charge of industrial sales in the New Jersey territory for the Westinghouse Electric & Manufacturing Company, has been appointed district manager of the Moloney Electric Company in charge of the territory extending from Boston to Baltimore. A graduate of the University of Colorado, Mr. Goldsborough became identified with the Westinghouse factory at Pittsburgh in 1910. Two years later he joined the Westinghouse staff in New York, where he spent twelve years.

C. L. Kurtz Resigns

Charles L. Kurtz, president of the Columbus (Ohio) Railway, Power & Light Company, resigned on January 27 at the meeting of the board of directors, thus bringing to a close a period in his career of outstanding achievement in the field of public utility management. This career followed a successful début in political life and began in 1903, when the Columbus Public Service Company was organized, of which he was made president. This company was soon leased by the Railway & Light Company, which failed in 1910. Out of its failure grew the present company.

When Mr. Kurtz assumed its presidency in January, 1919, the Columbus Railway, Power & Light was, like various other companies of which street-railway operation was a main feature, in deep water, and a receivership had been applied for. Mr. Kurtz immediately instituted a program of rigid economy and constructive effort. The receivership was avoided, bond interest payments resumed, and in two years stockholders received preferred stock in lieu of past-due dividends. Since then

C. L. Kurtz

all dividends have been paid regularly. During the period that the company was under his direction more than $13,000,000 was spent for construction and rehabilitation.

Mr. Kurtz has been prominently identified with many other commercial undertakings since he abandoned politics for business and retains an active interest in some of them despite his seventy years.

L. A. Savage, formerly connected with the construction activities of the Byllesby Engineering & Management Corporation on the projects of the Western States Gas & Electric Company on the American River, has been appointed supervisor of transportation for the San Diego Consolidated Gas & Electric Company.

Frank A. Belden, manager of the Portsmouth (N. H.) Power Company, has resigned to join the staff of the general superintendent of the Edison Electric Illuminating Company of Boston, where he will be assigned to special work. Mr. Belden is vice-president of the New England Division of the National Electric Light Association and has been active for some time in investigating the economics of rural-line service. He has been largely responsible for the growth of the Portsmouth company's excellent public relations and has an enviable record as an executive.

W. H. Osterle, electrical engineer for the Charles M. Kelso Company of Dayton, Ohio, for the past three years, has resigned his position to take an engineering position with the Dwight P. Robinson Company on its work for the Duquesne Light Company of Pittsburgh.

E. B. Glazier, district superintendent of the West Penn Power Company at Scottdale, Pa., has been transferred to the company's sales department at Pittsburgh, Pa.

W. H. Knutz, formerly district engineer of the Public Service Company of Northern Illinois at Evanston, Ill., is now on the staff of the Northern Indiana Gas & Electric Company, Hammond, Ind., another Insull property.

W. Frost Minor, vice-president and director of Edward Miller & Company, Meriden, Conn., electrical and gas fixture manufacturers, has been elected treasurer of the company to succeed Samuel McNab, who resigned because of ill health. Mr. Minor was born at Peoria, Ill., and has been identified with the electrical industry for twenty-four years. Before going to Meriden last September he was connected with the Ivanhoe-Regent Works, recently acquired by the Miller organization from the General Electric Company.

Obituary

Janson Bridges, manager of the Hermann Electric Light Company, Hermann, Mo., was electrocuted January 25 while repairing street wiring damaged by a recent storm. Mr. Bridges had been manager of the company since last November, when he was appointed to that office to succeed August Biermann, deceased. He was forty-five years of age.

Lynn B. Easton, manager of the Laidlaw works of the Worthington Pump & Machinery Corporation, died January 24 at Cincinnati, in his thirty-ninth year. In more than twenty years of work at Laidlaw and in the sales department of this corporation Mr. Easton had held many positions, starting with that of time clerk and ending as manager of the works.

William G. Mills, Southern division manager of the National Carbon Company, died suddenly January 19 at his home in Atlanta, Ga. Mr. Mills was fifty-one years old and was born in Philadelphia. He began his career in the Wanamaker stores, but became affiliated with the Carbon company after a few years and soon was made assistant district manager of the Eastern district, and later was transferred to New York. He was subsequently sent to New Orleans as manager of the Southern division.

Hugh Irving Millard, formerly superintendent of the London, Ont., light and power plant, died of apoplexy at Erie, Pa., January 22, at the age of thirty-eight years.

Recent Court Decisions

Loss from Failure to Furnish Power Held Equivalent to Interest on Idle Machinery.—In Pendergast Cotton Mills vs. Tennessee Power Company the Supreme Court of Tennessee has sustained the decree of the lower court. In this suit it was alleged that the Tennessee Power Company contracted to furnish certain electric power to the Pendergast mills upon a certain date and that the mills installed valuable machinery upon the faith of the contract. The power company was unable to furnish the power on the date agreed upon, and damages were awarded to the mills for the delay equal to interest upon the investment made by the mills in the machinery which remained idle during the period of the power company's default.

Lower Riparian Owner Liable for Damages from Percolation When His Dam Throws Water Back on Upper Lands.—In Healey vs. Citizens' Gas & Electric Company the respective rights of lower and upper riparian owners were in dispute. The plaintiff charged that a dam built by the company had backed waters from the Cedar River over his land, thereby causing him loss. The trial judge held that no damage could be assessed for percolation but only for overflow, and the jury found for the defendant. The Supreme Court of Iowa has reversed this finding, holding that the separation of the damage caused by the defendant and that due to natural causes was a matter for the jury. The lower riparian owner may not destroy the upper owner's property by back water, nor may the upper owner ordinarily use all the water for himself. That the lower owner had a permit to construct the dam and that it was not negligent in building it did not alter the case. (201 N. W. 118.)*

State Must Pay for Power Rights of Riparian Owners.—Power rights of riparian owners taken by the state in developing navigable streams must be paid for by the state, the New York Court of Appeals has ruled, affirming a three-to-two decision of the Appellate Division which upheld the Court of Claims in making an award of $250,000 to the Waterford Electric Light, Heat & Power Company for the acquisition by the state of power rights and land along the Hudson River between Waterford and Mechanicville. The Legislature of 1901 granted to the power company a franchise to construct a dam on its river-bank property, but before work was begun the Barge Canal construction project was passed by the Legislature of 1903, providing for canalization of the river at this point and authorizing acquisition of the land. In 1910 the state took over the land and built a canal lock and dam where the Waterford company had planned to build its power house and dam. The company brought action to recover $350,000, and a claim of $250,000 was allowed. It was the contention of the state that the company was entitled only to the value of the land acquired by the state, that all franchise grants of water power contain the reservation that the state has a right to improve navigation, and that canalization of the river was such an improvement. The company contended that the river was not navigable at its property because of rapids and a fall of 18 ft.

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Contributory Negligence as Applied to Children.—Damages granted by the trial court in Haselmaier vs. Milwaukee Electric Railway & Light Company because of the injury of a nine-year-old boy from touching a live power wire hanging from a pole, owing, it was charged, to the failure of the company to exercise ordinary care, were affirmed by the Supreme Court of Wisconsin. The court held that although one voluntarily subjecting himself to danger assumes the risk or is contributorily negligent whether or not he fully realizes the precise nature of the danger, none the less this doctrine is inapplicable to a boy of the age stated who saw other children touch the wire and receive only a slight shock and who had no real comprehension of the grave risk he ran. A statutory provision for treble damages in certain cases was held applicable only to property damage, not personal injury, and an appeal from the plaintiff for $15,000 instead of $5,000 was not allowed. (201 N. W. 257.)

Commission Rulings

Membership Fees Not Operating Expenses.— The Indiana Public Service Commission has placed no restrictions on the payment by public utilities of chamber of commerce membership fees, club dues, etc., out of the net earnings of the utilities, as wrongly supposed in some quarters. The commission has ruled only against charging such expenditures to operating expenses.

Zone Rates for Towns Served by Natural-Gas System. — The Oklahoma Corporation Commission has denied an application of the Tulsa Tribune Company and others to fix a temporary rate on natural gas in Tulsa and has ordered that the application for such temporary rate be consolidated with a case brought by the commission and now being heard seeking to determine the proper rates for all of the cities and towns furnished with natural gas by the Oklahoma Natural Gas Company. The commission holds that rates could not be properly established for Tulsa alone. Any rate fixed for Tulsa must take into consideration not only the cost of gas and its distribution in that city but the value of the production and transmission system which is necessary to give this service to Tulsa and other towns.

Separate Factories of Same Manufacturer Served from Same Line Should Be Billed Separately. — The Indiana Public Service Commission has refused to permit the American Steel Foundries to continue to lease from the Northern Indiana Gas & Electric Company a transmission line originally built to connect two of the manufacturing company's factories, more than four miles apart, which were treated as one customer. The contract having expired, the commission found that the two plants should be treated as separate and distinct customers and should be billed separately and that the connecting transmission line should be used for general service to the public, notwithstanding petitioner's claim that this would increase its payment for energy unreasonably. The commission thus summarized its findings: "(1) That where factories or other establishments are located in a space the approximate size of a city block, one meter is sufficient to serve them; (2) that if petitioner in this cause were permitted to continue the use of one meter for its two factories, the Northern Indiana Gas & Electric Company would be compelled to apply the same privilege under similar conditions to all other consumers, which is unreasonable, preferential and unlawful."

Certificates of Convenience and Necessity as Affected by Federal Power Commission Jurisdiction.—In granting conditionally a certificate to the Alabama Power Company for the construction of dams and power houses on the Tallapoosa River the Alabama Public Service Commission said: "A certificate of convenience and necessity authorizing the development of water-power plants by utilities holding licenses from the Federal Power Commission should reserve all the rights, privileges and options reserved under the federal water-power act with respect to acquisition by the state or a municipality, and should limit the term to the time when the property is taken over or a new license is issued by the United States, in the event that the United States or the state or some municipality does not exercise the right to take over the project or the United States does not issue a license to a new licensee or the United States does not issue a new license to the original licensee."

Commission Cannot Approve Exercise by One Company of Franchise Granted to Another.—The New York Public Service Commission has denied the joint petition of the Northern Light & Power Company, Inc., and the Malone Light & Power Company for an order permitting the Malone company to serve, under a temporary permit, a number of prospective customers along its transmission line in the town of Westville, Franklin County, in which town the Northern company has a franchise which it is now unable to exercise. Both companies are owned by the same interests, but the Northern company is as yet inactive. The franchise in the town of Westville has been approved by the Public Service Commission, but its order was not accepted because of other terms and the matter is now in the courts. The commission holds that it has no power under existing laws to approve the exercise by one company of franchise rights granted to another.

Manufacturing and Markets

Trade Societies and Law

Attorney-General Stone Comments on the Report of the Federal Trade Commission

THE Federal Trade Commission last October made an exhaustive report to Attorney-General Stone upon an investigation made by it at the instance of the Senate into the manufacture of various commodities with a particular view to the discovery of whether or not the association activities of manufacturers violate the provisions of the Sherman act. In advising the commission of contemplated action to be taken on the report by the Department of Justice, Attorney-General Stone says that certain provisions of the dissolution decree of the Aluminum Company of America appear to have been violated and that further investigation has been ordered.

As to the competitive conditions in this case the conclusion was arrived at by the commission that "the Aluminum Company of America at present controls more than 90 per cent of all known deposits of bauxite in North America that are of such a character that aluminum can be manufactured therefrom in commercial quantities. Having this practically complete control of the sources of supply of the raw material, it is in a position to and does control the domestic price of sheet aluminum to utensil manufacturers."

The alleged "blacklisting" practices of "broom-corn" dealers have been changed, the Attorney-General states, adding that "about the only successful effort of the association is its department for the co-operative purchasing of supplies used in the manufacture of brooms." During the past year special agents of the department have made a thorough investigation of the refrigerator industry. A summary report has recently been filed and is receiving careful consideration.

Analysis of Commission's Report on Vacuum Cleaner Association

Analyzing in considerable detail the commission's findings with relation to the Vacuum Cleaner Manufacturers' Association, it is the view of the department that this association was composed of licenses under basic patents that expired March 19, 1924. With respect to resale prices, there is not shown any concert of action between the different manufacturers upon this point. Each had his own prices for his cleaners, which were not uniform as between manufacturers, and each tried to have his fixed prices maintained by his dealers, and "this fact alone would not violate the Sherman act."

The commission's report upon the vacuum cleaner industry does not seem to have been brought down beyond the year 1922, and the Attorney-General is of the opinion that "unless it can be shown that the members of the association have adopted some new methods, such as the establishing of a patent pool, or some agreement or understanding to enhance prices, or similar scheme, since the close of your investigation, there does not appear to be sufficient in your report to justify the conclusion that this association still exists or is employing methods in violation of the anti-trust law."

Mr. Stone concurs in the conclusion of the commission relative to the washing-machine industry that "the combining of competing patents by large and financially strong competing manufacturers accompanied by the legal rights of patent owners under existing patent laws to control production and fix the price at which the patent article is to be sold constitutes a combination no less dangerous to the consuming public than a monopoly created by acquisition of competitors or agreements among competitors in restraint of trade which are condemned by the anti-trust laws." But at the same time, he adds, the basic patent in the industry was the Stocking-Mendenhall patent, which expired June 14, 1921, and that patent was owned by the Iowa Washing Machine Company, and "if that company was guilty of unlawful conduct prior to the expiration of its patent, more than three years having elapsed since that time, a prosecution would be barred and a court would not restrain acts no longer committed." The real "vice" in the washing machine industry consists, it was held, in the pooling of patents owned by the Maytag Syndicate and the National Household Devices Company and in forcing other manufacturers to secure a license under them."

Directing attention to the General Electric and Westinghouse companies cases, already submitted to the court, and the washing machinery case soon to be heard, in which the validity of the so-called pooling agreements is contested by the government, the Attorney-General states that "other cases are pending in which similar questions are involved, . . . and if the department is right in its contentions, then the pooling of the washing machine patents under the agreements set out in your report is unlawful, and appropriate action will be promptly taken." It will be necessary, however, before any action can be taken to bring the commission's investigation down to date, as the report dealt only with conditions up to 1922.

Selling Specialties Through Jobbers

How One Jobber Has Increased His Sales and Better Served His Customers by Grouping Allied Lines—Jobber Can Be of Real Service in Distribution

By John Olsen
Selling Manager Central Electric Company, Chicago

THERE is a feeling among some manufacturers of electrical specialties that the jobber has not been of as much service in distributing specialties as he has been in distributing commodities known as staples. This feeling is the result in most cases of unsatisfactory experiences of manufacturers in obtaining active distribution of these products through jobbers. Some manufacturers recognize that the turnover which the jobber may expect on a specialty is small compared with that which he experiences with his staple lines. The conclusion reached by many manufacturers and some jobbers is that the jobber cannot afford to devote as much attention to the specialty as he devotes to staple lines and that he cannot therefore be expected to serve the manufacturer of a specialty as completely as he does the producer of a staple commodity.

It would appear, however, that such conclusions are the result of a rather too general application of the theory of jobber distribution. The methods to be employed in insuring distribution for specialties may rightfully be quite different from those employed in the distribution of a standard commodity, but the jobber can, it has been demonstrated, be of real service in the distribution of specialties.

The problem of the jobber in the distribution of a specialty is to see that he is able to and does give to the specialty the type of service which its sale demands. This service extends to both the manufacturer and the purchaser of the specialty and involves much more than the listing of the product in the jobber's catalog and the handling of orders and the acting as a collection agency for the manufacturer.

Jobber's Problem in Specialty Selling

Some time ago this company realized the problem of distributing a specialty as outlined above and decided that the way to sell a specialty was to give particular attention to the service to which the specialty would be applied. It was apparent that specialized attention to every single item carried would involve an excessively large organization and that the volume of sales to be expected would not justify the entire time of one man. The working out of the plan may be illustrated by the way street-lighting specialties are being sold. Formerly the cable for street-lighting installations was sold from the wire and

cable department, transformers were sold from the transformer department, lamps and glassware from the lamp department, and various specialties were carried as independent items in stock. The company formerly carried four or five different makes of the same item. It was, of course very difficult for the salesmen on the job to become thoroughly familiar with the details and advantages of every item listed in the catalog. Consequently, the salesman was guided in his judgment to a large extent by the popularity of certain items and by his knowledge of the satisfactory results to be derived from the use of a particular specialty. But the salesman was in many cases unable to assist the purchaser in the selection of just the proper make for a particular application. Under this old arrangement a salesman had to cover a lot of territory not only geographically but technically and commercially and it was not to be wondered at that he frequently sold articles which had the largest call or the lowest price.

GROUPED ITEMS AID SELLING

It was decided to group four or five items of an allied nature, or items that would logically fall in the same installation and would be sold to the same purchaser and might therefore well be handled by one man or by a department organized to carry on the sale of every specialty of this particular group. A street-lighting department was therefore organized, and sales engineers were assigned to this particular class of business and were permitted to devote their entire time to the development of the potential market and to the servicing of existing business.

In this street-lighting group were included the underground cable, the lamp post, the lamp head, the current transformers, the street-lighting transformers, the control equipment, switches, potheads and all devices included in the lamp circuit or necessary for the complete furnishing of a street-lighting installation. The men in this department are expected to become familiar with every item carried and to make a study of the purchaser's problem with the object of assisting him in the selection of the right type of complete installation and the specialized apparatus that is necessary to make the installation function properly. In this way this company is able to sell equipment which will function when it is put into service and a volume of business has been realized that would not have been achieved by the methods previously employed.

Under this departmental plan of operation it has proved wise to limit the number of makes of similar apparatus. This is only fair to the manufacturer, and it is the only way in which the jobber can hope to build up a large, steady and profitable volume of business. One jobber cannot sell all the similar products manufactured, but he can confine himself to one or two products and can by knowing these products well adequately serve the purchaser. Experience has shown that this same plan can be adapted to many groups of specialties and that under it sales will increase, stock and inventory will decrease and both the jobber and manufacturer will make more money.

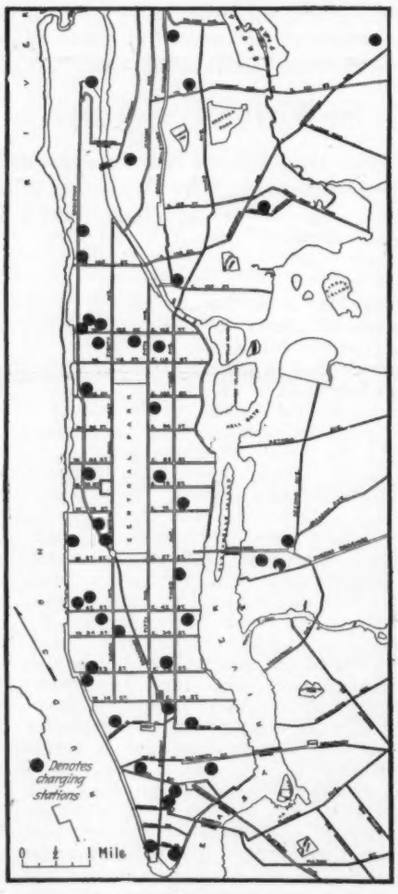
In securing distribution for a specialty the manufacturer might well consider just what jobbers in his territory are in a position to sell and service his article. He will find that good results will be had from such distributors as are willing to create a special department with individualized attention to a given group of specialties. Manufacturers may well consider the fact that the purchaser is generally interested in buying a complete installation and in getting a complete service. The manufacturers, therefore, should seek those jobbers who will give this complete service to the purchaser and who will confine themselves to one or two items of a similar nature, because only in this way can satisfactory sales of a specialized product be secured through the jobber.

Electric Garage Facilities

A Means of Simplifying the Use of "Electrics" and Thereby Increasing Demand for Them

BY C. A. STREET
General Sales Manager Walker Vehicle Company

WHEN Edward E. LaSchum, general superintendent of motor vehicle equipment, American Railway Express Company, writes a 300-page illustrated book entitled "The Electric Motor Truck," one can hardly avoid admitting that electric trucks are receiving greatly increased attention for city-route transportation. The fact that the American Railway Express Company uses more than 1,500 electric street trucks in its business of trucking and is continually adding more electric trucks should be pretty substantial proof of the sound economic value of these trucks for city routes. Mr. LaSchum's book on the selection, application, operation and maintenance of electric trucks is particularly significant following as it did just as intensive a study of gasoline trucks. It goes without saying that a man having the supervision of the largest fleets of both gas and electric trucks in the world would not waste time on a subject which does not deserve the serious consideration of city truck users everywhere. In addition to the large fleets in the service of this great express company there are hundreds of electric truck fleets in the service of other leading American business organizations whose names also spell success and progress.



MAP OF MANHATTAN AND VICINITY WITH FORTY-THREE CHARGING STATIONS WITHIN THE TERRITORY SHOWN
(Compiled by the Automobile Bureau, New York Edison Company)

Individuals or companies that are interested in the continued progress of electric trucks are faced with the responsibility of making the use of electric street trucks as simple as possible. First in this process of simplification comes the establishment of more battery-charging equipment in public motor-truck garages. Thoroughly reliable motor-truck garages in selected locations are the most logical places to establish additional charging facilities. This will not only benefit truck manufacturers but also electric truck users who are without charging equipment, and it will also profit electric service companies and battery manufacturers. A system whereby charging equipment may be installed in selected motor truck garages in the various districts of each city on a rental or time payment basis, or a combination of both, may be worked out on a mutually profitable basis. Think of the effect of advertising such widespread charging and garaging facilities to truck users. Think of the effect not only on the truck users, but on other garage owners and the electric truck industry in general. An example of the excellent charging facilities in the territory of the New York Edison Company is shown in the accompanying map of Manhattan and vicinity. This wide distribution of charging stations makes the selling of electric trucks considerably easier in New York City.

Electric trucks are pre-eminently successful in cities where they have been properly introduced and garaged. Yet a survey of the cities where electric trucks have not been actively represented and a survey of the many lines of business in which electric trucks can be used most profitably reveals the fact that there is a tremendous market ahead for electric street trucks. Simplification of use has always been one of the major means of breaking down sales resistance. The matter of increasing electric truck garage facilities for the benefit of electric truck users and prospective electric truck users who do not operate enough trucks to install their own charging facilities is of vital importance to the rapidly growing and fundamentally sound electric truck industry.

Training Branch-Office Salesmen by Precept and Example

By E. Gordon Hall
Sales Manager for Northeastern District of the Regina Corporation

AN EFFECTIVE plan for training salesmen of the Regina Corporation embodies two distinct ideas: first, the creation of a kind of selling formula crystallizing into workable form every tactic and argument which have made for success in merchandising, and second, field work by executives. Each staff meeting held at the district office serves as a clearing house where these various successful methods are discussed and incorporated into guides for use in the field, and at these conferences each salesman reviews his "one big day," or the day on which, in a specified interval of time, he has made a high record in selling. In one case a "one big day" may have resulted from a well-prepared argument delivered with convincing appeal; in another instance a forceful personality brought exceptional success, and in another case a practical demonstration sufficed to close a contract.

By developing a composite form of sales attack using every attribute that made for success as disclosed by various salesmen, a formula can be evolved which, if adhered to faithfully by each salesman, cannot fail to bring success. No single sales form of argument, set of methods or tactics can always meet with success. From time to time new conditions confront the selling force; new districts are canvassed and new problems are presented. At the clearing-house conferences these new conditions are discussed and studied; a new plan of attack is often necessitated and the "formula" is revamped accordingly. Always a definite program is adopted and then recommended for use in the field.

The practicability of this plan is attested by the rapid increase in the vacuum-cleaner sales of the Regina Corporation, and this is a real stimulation for its salesmen. Discussion shows that they are treading on sure ground with an impetus toward success as reliable as an adherence to a mathematically correct equation which will solve a given problem. The burden of proof of the workability of this plan, as described, does not rest on the field force alone. Both office managers and sales managers assume responsibility and on frequent occasions go out in company with solicitors and verify, by closing contracts, invaluable personal aid in merchandising their product.

Business Conditions

IMPROVEMENT in business is being steadily noted in virtually all sections of the country. Industrial firms continue active. Apparently the accumulation of surplus material is now being used up, as apparatus is being purchased for equipping new machinery as well as for replacements and maintenance. The greater economies being sought by industry are reflected in its buying power. Central-station companies have been requesting quotations covering a large amount of switching and auxiliary construction equipment, and manufacturers express the belief that a great deal of business from these sources lies ahead.

Utility financing has found a very ready market and bonds offered have been quickly absorbed. The United States Steel Corporation has reported an increase of 220,647 tons in unfilled orders on January 31. This brings the total of such business up to 5,037,323 tons—the largest volume of forward business reported since the end of August, 1923.

In New England business is showing steady gains, and underlying conditions are better in the whole district. An intensive electric furnace campaign conducted in that territory is producing repeat orders in gratifying numbers. Purchasing by industrial firms continues good in the New York district, and central-station companies have been very active in requesting quotations on a variety of switching and auxiliary construction material. In the Southeast several large industrial contracts have been closed and a number of others are in immediate prospect. January building permits in Atlanta for the first time show a preponderance of factory construction in that section. Industrial sales have been active in the Middle West, but while central-station purchasing of poles, cables, pole-line hardware and similar material is good, major equipment purchases have decreased materially. On the Pacific Coast the volume of business is good and is composed of many rather small orders.

German Electrical Exports 75 per Cent of 1913 Figures

THE total exports of the German electrical equipment industry during the year 1924 were 75 per cent of the 1913 figures, according to advices received by the Department of Commerce. It is stated that in many instances articles are being sold below the present cost of replacement. Since the war American manufacturers have gained ground in markets formerly considered German monopolies. The German price level has been seriously reduced by domestic competition.

Non-Ferrous Metal Market Dull but Firm—Little Export Sales

THE volume of business transacted on the non-ferrous metal market has not been great, but prices are firmer, being somewhat helped by the fact that London prices are being held. Limited sales of copper have been made at 14⅞ cents, although most of the large producers are still holding their prices at 15 cents. The uncertainty of the market has caused domestic purchasers to withhold buying, although consumption continues at a good rate.

The American Smelting and Refining Company has maintained its official contract price for lead at 9⅜ cents. However, further weakness in the London market has resulted in sales by smaller producers at 9⅛ cents. An attempt to get a better price failed to produce orders above that figure. The demand for zinc has not been active, but domestic consumption is good. Buyers are apparently watching the foreign market, where prices have weakened. Although the demand for tin has been dull, the London market has been firmer and the price increased slightly.

NEW YORK METAL MARKET PRICES

	Feb. 4, 1925 Cents per Pound	Feb. 11, 1925 Cents per Pound
Copper, electrolytic	14⅛	14.85
Lead, Am. S. & R. price	9⅛	9⅛
Antimony	18¼	20
Nickel, ingot	31	31
Zinc, spot	7.70	7.75–7.80
Tin, Straits	57	57⅛
Aluminum, 98 to 99 per cent	28	28

Industrial Plants Active in Southeastern District

SEVERAL large industrial contracts have been closed in the Carolinas and Georgia, in the last week, with a number of others in immediate prospect. Heavy central-station construction already under way and to be immediately undertaken, such as the tie-in of the systems of the Georgia Railway & Power Company and the Augusta-Aiken Railway & Electric Corporation, is serving to maintain the high level of central-station purchases. Appliance sales generally are reported very satisfactory, with a noticeable tendency on the part of new hotels to go in liberally for electrical equipment for their kitchens, two jobs amounting to approximately $3,000 each having been recently closed. Despite inventory period and very adverse weather conditions all during the month, electrical jobbers report January business as satisfactory, one jobber stating that it was the best January in the history of his company, particularly in Florida where sales increased tenfold in the past six years.

Building permits in Atlanta for January amounted to $1,463,667, an unusual feature of this being that for the first time in history the permits for factory construction surpassed those for residences by a considerable amount. Construction in the entire Southeastern territory is heavy, with a consequent heavy demand for all construction materials. Purchases by small contractors and dealers have shown increases during the past week, the orders being for the general line of materials for small jobs, the most active articles being wire, armored conductor, conduit and switches. Recent reductions in the price of certain types of radio equipment have caused a flurry in this field but are not yet reflected in increased sales volume. While one jobber reports his January radio sales as under those of January, 1924, generally the demand for this specialty is very active. Sales of battery-charging outfits are fine, but slow shipments are not permitting the accumulation of any stocks on this commodity.

The value of agricultural products in

six Southwestern states increased $120,000,000 in 1924 over 1923, and this is an important contributing factor to generally improved conditions throughout the section. There is a tendency on the part of certain sections to follow Florida's lead in relieving new capital of taxes, and during the past month one county in Georgia passed laws exempting new industries from ad valorum taxes for a five-year period. Several new textile mills have recently been transferred to the Southeast, and others are negotiating for locations. This will be reflected in the volume of electrical construction materials purchased during the next few months.

Industrial Sales Good in New York District—Utilities Active

PURCHASING by industrial companies continues good in the New York district. Steel mills have been particularly active in buying equipment, not only for maintenance purposes and replacements but also for equipping new apparatus. Central-station companies have been making many requests for quotations on switching and auxiliary construction apparatus, and much more activity is evident than there was a month ago.

Among the requests for quotations is one by a large holding company for a diversified line of switching equipment that will total more than $100,000, one for approximately $35,000 and another for about $50,000. Various other inquiries cover a variety of equipment. Manufacturers are optimistic and express the belief that there will be much business transacted by utilities in the next few months. Many orders are not yet being closed, but this will naturally follow soon. Both power and distribution transformers, principally of the power type, have been much in demand, and one order recently closed calls for $26,000 worth of apparatus. Sales by jobbers are good and well diversified with a strong demand for building-construction material. One jobber reports that sales last month were better than in the corresponding period last year and that general supplies are moving well.

Business in New England District Showing Steady Gains

SOLID gains over last year's business are being recorded from week to week in the New England electrical trade, although the market is by no means free from dull areas. Underlying conditions are better in all six states, and the textile mills are again becoming a market factor. One Rhode Island mill has purchased more than 300 fractional-horsepower loom motors and another has ordered about $7,000 worth of integral horsepower motors for spinning frame driving. Industrial departments of manufacturers' branch offices are very busy answering inquiries and making bids. This territory is being intensively canvassed for electric heating prospects, and repeat orders from furnace users are being booked in gratifying numbers.

Central stations are prominent in the supply market, and within the week a carload of pole-line hardware was sold for use in New Hampshire. Western Massachusetts took three carloads of poles and one of fiber conduit. Inside wiring supplies are not so active as might be expected, since in some sections increased tax rates have deterred building. Retail trade is improving, especially in washers, portable lamps, flatirons and kitchen units. A group of thirteen central-station plants sold $53,742 in electric appliances last month aginst $34,161 for January, 1924. Radio sales are close to the seasonal peak.

Industrial Sales Active in Middle West

INDUSTRIAL purchasing in the Middle West has been active, but central-station purchasing is off to a certain extent. While there has been quite an active demand for pole-line hardware, poles and cable, no particularly large orders have been placed and major equipment purchases have decreased materially. There was a fairly good demand for motors and switches, and maintenance purchasing has continued good. Jobbers have reported a good volume of business that has been well diversified.

Several large building contracts tended to cause an influx of orders for building materials. Appliance sales have been good, particularly for small heaters, owing to the present mild weather. Hotel and restaurant equipment sales have quickened somewhat, and indications point to a better year in 1925 than in 1924, although last year there was a marked increase over the previous year. The demand for radio is excellent and set manufacturers report six to eight weeks of future business on their books. Reports from the cotton mills, particularly those engaged in the manufacture of threads, appear to indicate that they are finished with their low-priced threads and will either increase their prices or shut down rather than continue on the present basis. This may have some bearing on the future price of such commodities as tapes.

Good Sales on Pacific Coast Consist of Many Small Orders

THE volume of business on the Pacific Coast is good and is composed of many rather small orders. Contractors appear to be buying larger stocks of roughing-in and wiring material. Orders reported recently include a carload of creosote, several carloads of conduit and 125 miles of bare iron wire. An inquiry for several carloads of fibre conduit has also been received. The trend of demand as well as the growing electrical business from Coast manufacturing is evidenced by a San Francisco order for 5,000 candle sockets. Several excellent requests for quotations on miscellaneous wiring material from railroads are reported.

Copious and well-distributed rainfall throughout the state has caused jobbers again to expect good business from the interior valleys, where business has lately been rather dull. The value of 1924 building permits from Fresno, the raisin center of the San Joaquin Valley, was only $1,645,188; in 1923 it was $5,906,697. Santa Rosa dropped from $1,175,676 to $770,860, and even Sacramento fell from $9,699,586 to $7,666,767. The big building gains have been confined to the Coast cities, and it has been hoped that the interior will again advance to its old standing. The difference caused a decided decrease in total 1924 business from dealers and contractors. Increasing attention is being paid to street lighting, especially in southern California, where several new projects are being figured.

Activities of the Trade

General Electric Company Pays Bonus to Employees

More than $1,000,000 in supplementary compensation is being paid this week by the General Electric Company to employees who had been in its service for five years or longer on December 31. This bonus payment is for the last six months of 1924 and amounts to 5 per cent of wages. A total of 28,499 individuals, in various works and offices of the company, will receive these payments.

Crocker-Wheeler Company Makes Sales Organizations Changes

The Crocker-Wheeler Company, Ampere, N. J., announces that its Baltimore office has been discontinued and the territory placed under the jurisdiction of the Philadelphia office. The company also announces the opening of an office in Atlanta, at 101 Marietta Building, Room 510, in charge of G. D. Anderson, Jr. Mr. Anderson was formerly a salesman attached to the Baltimore office.

S. M. Conant, who was in charge of the Baltimore office, has been transferred to the company's main office at Ampere as a member of the headquarters sales staff with the title of assistant sales manager. Mr. Conant will devote his time to following up special classes of sales and assisting various sales offices in special negotiations.

Republic Flow Meters Settles Litigation with Brown Instrument

The suit brought by the Brown Instrument Company in the United States District Court at Chicago against the Republic Flow Meters Company and certain individuals has been settled. The suits brought by the Republic Flow Meters Company and the same individuals in the same court against Richard P. Brown have also been dismissed.

The officers of the Republic company did not wish to be under the imputation of illegally using any of the original construction of the Brown company, it having been called to their attention that there were pending on behalf of the Brown company patent applications

covering some of these features. The Republic company has, therefore, changed the construction of its indicating and recording pyrometers announced by it for the purpose of avoiding infringement either of patents or of original designs or construction of the Brown company.

G. & W. Electric Specialty to Move Into New Factory Shortly

The G. & W. Electric Specialty Company, manufacturer of potheads, cable boxes and distribution specialties, will move into its new factory at 7780 Dante Avenue, Chicago, the latter part of March. The new property, valued at $110,000, includes a combined factory and office building with a floor area of 32,000 sq.ft. The building is so constructed as to permit continuous movement of material from the receiving platform at the rear to the shipping platform at the front of the factory. Elevated portable platforms will permit moving material without its touching the floor. Provision has been made for future expansion through the erection of additional units adjacent to the present building.

The Jeffery-Dewitt Insulator Company, Kenova, W. Va., announces the receipt of two orders for insulators from the São Paulo Tramway, Light & Power Company, São Paulo, Brazil. The second lot of 12,000 insulators will be shipped this month. The Allen Brothers Engineering Company, Ltd., Hamilton, Ontario, are inspectors representing the Brazilian Company on all purchases.

The Newport News Shipbuilding & Dry Dock Company, Newport News, Va., announces the appointment of E. I. Cornbrooks as sales manager, succeeding Benjamin G. Fernald, who has resigned on account of ill health. Mr. Cornbrooks has been connected with the company for nearly twenty years as chief draftsman in the hull department and has had an important part in the development of the company's new products since the depression in shipbuilding rendered it imperative that other lines of activity be covered by the company.

The General Electric Company is now placing on the market a new model 2-amp "Tungar" battery charger which is said to be a refinement of the older type and is more compact.

The Kelvinator Corporation, Detroit, announces through its president, A. H. Goss, that the shipments of electrical refrigerating units from the factory in January were about three times larger than for January, 1924, and orders were more than five-and-a-half times greater. Unfilled orders on January 31, 1925, were more than twelve times as large as unfilled orders on January 31, 1924.

The Moloney Electric Company, St. Louis, announces the appointment of James Goldsborough as district manager of its New York territory, extending from Boston to Baltimore, with offices at 50 Church Street, New York. For the last two years Mr. Goldsborough was in charge of industrial sales in the New Jersey territory for the Westinghouse Electric & Manufacturing Company.

The Conlon Corporation, Chicago, manufacturer of Conlon electric clothes washers, announces that it has since Jan. 16 promoted a number of its field representatives to the position of district managers as follows: C. E. Vollmayer, Waterbury, Conn.; W. J. Marshall, Cleveland; J. F. Fosnight, Kansas City; J. B. Derr, Philadelphia; D. D. Napier, St. Paul; H. L. Dollahan, Chicago, and F. B. Moore, Toledo, Ohio. R. J. MacDowell and E. C. Connolly have also been appointed as assistant sales managers and W. A. Brown as advertising manager, all three with headquarters at Chicago.

Pass & Seymour, Inc., Solvay Station, Syracuse, N. Y., manufacturers of electric wiring devices, have placed on the market a "P. & S. super-standard key socket" with high-heat-resisting key. This new socket has a key of special high-heat-resisting material and is designed to endure the higher temperatures of the gas-filled lamp. It is furnished in either black or brown color on "P. & S. Fluto" sockets.

The Henry N. Muller Company, 812 Westinghouse Building, Pittsburgh, announces that Herbert E. Ransford has become associated with the company. The company further announces that it is prepared to give engineering sales service as district representatives for the Lapp Insulator Company, the G. & W. Electric Specialty Company, Schweitzer & Conrad and Hitchner & Hitchner poles.

New Equipment Available

Automatic Starter

An automatic starter, with full safety features, for alternating-current squirrel-cage motors has been developed by the Crocker-Wheeler Company, Ampere, N. J. The starter is designed in two sizes for use with two-phase or three-phase, 25, 40, 50 or 60-cycle motors, 7½ hp. to 60 hp., 220 volts, and 7½ hp. to 125 hp., 440 or 550 volts. Auto-transformers are used to supply the starting voltage, which is applied for a definite period of time, after which full voltage is automatically applied. These transformers can be easily removed for substitution of transformers of different voltage or frequency without disturbing the starter.

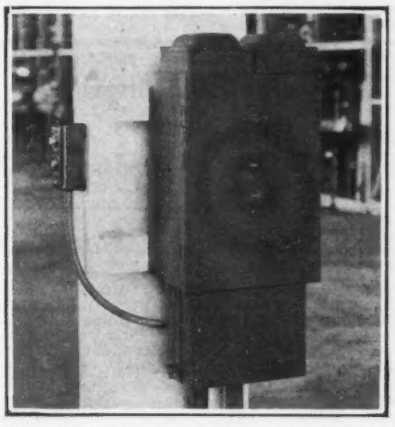


FIG. 1—AUTOMATIC STARTER WITH STOP-AND-START PUSH-BUTTON

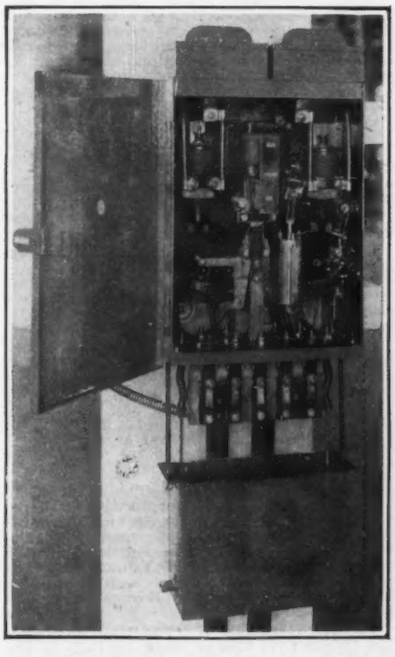


FIG. 2—INTERIOR VIEW OF AUTOMATIC STARTER WITH OIL TANK LOWERED

The starter consists of three principal parts—the back case, which serves as a support and wiring junction box, the case and the oil tank assembly. When putting the starter proper on the back case it drops to its final position by gravity. The contact board is connected to the actuating mechanism in the case by a connecting rod and may be detached as a unit. The overload relays have oil-immersed contacts and are adjustable for both time and load setting. The single lifting magnet used is energized only during starting and is disconnected when the starter is in the running position. By an ingenious arrangement this single lifting magnet performs both starting and running functions. The no-voltage magnet consumes only about 15 watts. A safety button automatically puts the starter in the "off" position should the door be opened. In this position the contact board is dead. Moreover, the oil tank cannot be lowered unless the starter door is opened. All contacts that wear are said to be easily replaceable.

Portable Sander and Grinder. — A portable sander and grinder known as the "Barker Model E" has been placed on the market by the R. L. Barker & Company, 642 West Washington Boulevard, Chicago. The gears and ball bearings are totally inclosed, run in oil and, like the motor, operates in dust-proof compartments. The motor is of the "Universal" type, operating from any 110-volt circuit, and has a rating of ¼ hp. Motors for 220-volt circuits can be furnished if desired. The machine is provided with an accurate screw adjustment to regulate the depth of cut.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase is desired in Fredericton, Canada, (No. 13,451), of electric fire-alarm whistle.

Purchase is desired in Melbourne, Australia (No. 13,482), of automatic railway switching equipment.

PROPOSED HYDRO-ELECTRIC PLANT FOR JAVA.—The construction of a 30,000-hp. hydro-electric plant with transmission lines to numerous industrial and agricultural centers, according to *Commerce Reports*, is soon to be built near the city of Soerabaya. Further particulars regarding location, ownership, etc., may be obtained on application to the Electrical Equipment Division, Bureau of Foreign and Domestic Commerce, Washington, D. C., by referring to No. 154,737.

ELECTRIC AND WATER SERVICE DESIRED IN COMAYAGUELA, MEXICO.—Electric and water service is desired in the town of Comayaguela, Mexico (population 8,000 to 10,000), which is virtually a suburb of Tegucigalpa, according to *Commerce Reports*. Further information may be obtained from the Electrical Equipment Division, Bureau of Foreign and Domestic Commerce, Washington, D. C., by referring to No. 157,142.

HYDRO-ELECTRIC PLANT FOR CEYLON.—Work will soon begin on the construction of a hydro-electric project, *Commerce Reports* states, which will supply electricity not only to Colombo, but to a considerable portion of the Island of Ceylon for lighting and power purposes.

New Trade Literature

FANS.—The Century Electric Company, 1827 Pine Street, St. Louis, is distributing bulletin No. 37, covering the "Century" alternating-current and direct-current portable and ceiling fans. It contains charts showing the general assembly of both its alternating-current and direct-current ceiling fans.

VOLTAGE-DROP CONTROL SYSTEM.—The General Electric Company, Schenectady, N. Y., has issued a booklet, known as Y-2041, in which it discusses the voltage-drop control system, what it does, etc. It contains illustrations showing several installations and diagram illustrating the operation of the voltage-drop control system.

CENTRIFUGAL PUMPS.—The Worthington Pump & Machinery Corporation, 115 Broadway, New York City, has issued bulletin W-607, calling attention to the "Worthington" centrifugal pumps for serving every industry.

ELECTRIC STEAM RADIATORS.—The Buffalo General Electric Company, Electric Building, Buffalo, is distributing a folder entitled "Steam Heat by Wire," in which it describes and illustrates the "Niagara" electric steam radiators. The radiator is manufactured by the Buffalo Gas Radiator Corporation, North Tonawanda, N. Y.

ELECTRIC IRONS.—Landers, Frary & Clark, New Britain, Conn., are distributing a folder calling attention to their new "Universal" and "Reliance" taper-point electric irons.

ELECTRIC TRUCKS.—The Ward Motor Vehicle Company, Mount Vernon, N. Y., has issued a sixty-six-page booklet covering the "Ward" electric trucks. It contains an article giving an outline of the history of the manufacture of electric trucks by the company, which began in 1903 in Pittsburgh, under the name of the Shadyside Motor Vehicle Company. Special attention is called to its new cradleless electric trucks, with battery under the seat instead of underslung from the chassis frame. A list is also included giving the names of the prominent users of the "Ward" electric trucks.

POLYPHASE POWER TRANSFORMERS.—The Pittsburgh Transformer Company, Pittsburgh, Pa., is distributing bulletin No. 2,039 covering the "Pittsburgh" polyphase power transformers. Illustrations are given showing various parts of the transformer. Bulletin No. 2,040 issued by the company describes the "Pittsburgh" polyphase transformer (five-legged design). It contains illustrations showing a large number of the transformers in different stages of manufacture from the building of the cores to the completed transformer.

INDUSTRIAL LIGHTING—Bulletin No. 394 issued by the Holophane Glass Company, 342 Madison Avenue, entitled "Holophane Industrial Lighting," describes its industrial lighting units with specific application in a large variety of industries. It contains data on the various lighting units and a number of illustrations showing typical installations.

ELECTRIC FANS. — The Robbins & Myers Company, Springfield, Ohio, has issued catalog No. 1,243, covering the "R & M" electric fans for alternating and direct-current circuits, non-oscillating, oscillating, ceiling and ventilating fans. It contains tables giving the dimensions, voltage, cycles, etc., of the various types of fans and instructions for mounting same.

RESISTANCE-MEASURING INSTRUMENTS.—Bulletin No. 135, entitled "The '2 in 1' Megohmer," issued by Herman H. Sticht & Company, 15 Park Row, New York City, describes and illustrates their Standco "2 in 1" megohmers, a combined megohmmeter and voltmeter, designed to meet all requirements for measuring insulation resistance.

WATER-TUBE BOILER.—The Kingsford Foundry & Machine Works, Oswego, N. Y., is distributing a booklet describing the "Kingsford-Webster" sectional water-tube boilers. It is built in either longitudinal or cross-drum design and in units of from 100 hp. to 3,000 hp., and for the high pressures demanded today. Illustrations are given showing various plants equipped with the boilers.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

PORTSMOUTH, N. H.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Feb. 17 for 300 domelight fixtures and 100 extra collars fitted to globes, for the local navy yard (Schedule 3274).

ARLINGTON, MASS. — The Arlington-Belmont Ice Company is planning to rebuild its local power house, recently damaged by fire. The loss is estimated at $50,000.

NEW HAVEN, CONN.—The United Illuminating Company has awarded a contract for the construction of a new building at its power plant on Grand Avenue. Alterations and improvements are to be made in the existing station, including the installation of generating equipment, etc. Westcott & Mapes, Inc., New Haven, are engineers.

Middle Atlantic States

BATH, N. Y.—The M. S. Cotton Manufacturing Company plans to install electrically operated machinery in its local woodworking plant.

BROOKLYN, N. Y. — Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Feb. 17 for furnishing lamp cord, magnet wire, etc., to the Navy Supply Depot, South Brooklyn.

BROOKLYN, N. Y. — The New York Board of Transportation plans to install electric power equipment at its proposed group of car repair shops in the Coney Island district, for which bids are being asked on a general contract. The cost of the entire plant is estimated at $10,000,000. John J. Delaney, 49 Lafayette Street, New York, is chairman.

BURLINGTON, N. Y.—The New York State Gas & Electric Corporation, Ithaca, has applied to the Public Service Corporation for permission to purchase the electric plant of D. Thorne Gardner in the towns of Burlington and Edmeston. The company proposes to erect a transmission line from New Berlin to Edmeston, a distance of 7 miles.

GUILDERLAND, N. Y.—The Municipal Gas Company, Albany, has applied to the Public Service Commission for permission to extend its electrical service in the town of Guilderland.

HUDSON, N. Y.—Bids will be received by the Superintendent of Purchase, Capitol, Albany, until March 5 for construction, sanitary and electric work in connection with the reconstruction of industrial building at the New York State Training School for Girls, Hudson.

JAMESTOWN, N. Y.—The Department of Public Works is considering placing the overhead wires in the business section in conduits.

KEENE, N. Y.—The Public Service Commission has granted the Northern Adirondack Power Company, Keeseville, permission to supply electricity in Keene. The company proposes to extend its lines from Jay to furnish the service.

NEW YORK, N. Y.—Bids will be received by the Superintendent of Purchase, Capitol, Albany, until March 5 for sanitary work, additional fire protection piping system, pumping equipment, new addition to power house, etc., to the New York House of Refuge, Randall's Island, N. Y. Specifications may be examined at the institution, Randall's Island; the New York office of the Department of Architecture, Fuller Building, and at the Department of Architecture, Capitol, Albany.

OLEAN, N. Y.—Extensions to the street-lighting system throughout the city is under consideration by the City Council.

OWEGO, N. Y.—The Public Service Commission has granted the Binghamton (N. Y.) Light, Heat & Power Company permission to take over the property of the Owego Light & Power Company.

ROCHESTER, N. Y.—The Rochester Gas & Electric Company, it is reported, contemplates the construction of a power plant on Lawn Street, to cost about $300,000. The company also plans to build a ten-story office building, to cost about $1,000,000.

SCHUYLER, N. Y.—The Utica (N. Y.) Gas & Electric Company has applied to the Public Service Commission for permission to extend its system in the town of Schuyler.

TARRYTOWN, N. Y.—Arrangements are being made by the Westchester Lighting Company, Mount Vernon, to build a new substation on Cortland Street in North Tarrytown, to cost about $200,000.

CONSHOHOCKEN, PA.—The Lee Tire & Rubber Company plans to install additional electric units for service at its local mill, and also a similar unit for its plant at Youngstown, Ohio, in connection with other improvements, to cost about $150,000.

HANOVER, PA.—The Hanover Power Company has applied to the Public Service Commission of Maryland for permission to erect an electric transmission line from the State line to Silver Run and Union Mills, a distance of 5 miles.

PITTSBURGH, PA.—Bids will be received by George W. Gerwig, secretary Board of Public Education, Fulton Building, until Feb. 19 for motors, fans, stokers, electrical work, etc., in the proposed addition to the Perry High School, at Perryville Avenue and Hemphill Street.

SCRANTON, PA.—The Scranton Electric Company has acquired 400 acres of land along the Susquehanna River in Exeter Township on which it proposes to erect a steam power plant of 80,000 kw. capacity, to cost about $10,000,000. The equipment will include two generating units of 40,000 kw. each.

WESTMINSTER, MD.—The Consolidated Public Utilities Company has petitioned the Public Service Commission for permission to erect a transmission line from the Reistertown Road from Westminster to the Baltimore County line and to erect other lines along public roads in Carroll County.

MOUNDSVILLE, W. VA.—The Ohio Power Company, Canton, Ohio, is negotiating for a site for a power house at Dillies Bottom, 2 miles south of here, on which, it is understood, the company proposes to erect a large power house this spring.

OPEKISKA, W. VA.—The Monongahela West Penn Public Service Company, Fairmont, is planning to extend its transmission line to Opekiska, to supply service at the proposed rock quarry of the General Stone Company, Amherst, Ohio.

WHEELING, W. VA. — The Eastern States Development Company, Wheeling, has applied to the Federal Power Commission for a preliminary permit for a water-power development on the New River in Virginia and Fisher River in North Carolina. The company proposes to construct a power plant on the New River, near Oldtown, Va., to provide for the diversion of surplus water from New River to head of Fisher River under head of

1,500 ft. Major H. M. Trippe is United States district engineer.

NORFOLK, VA.—The Ford Motor Company, Highland Park, Detroit, is planning to install electric power equipment in the proposed second unit of its local plant, for which plans are in progress, to cost about $1,000,000.

WASHINGTON, D. C.—Bids will be received at the United States Engineer office, 250 Land Office Building, Washington, D. C., until March 3 for furnishing, installing and testing motor-driven pumping units.

WASHINGTON, D. C.—Bids will be received at the office of the General Purchasing officer of the Panama Canal, Washington, D. C., until Feb. 19 for junction boxes, pull boxes, knife switches, mica, solder, cable clips, etc.

WASHINGTON, D. C.—Bids will be received by the General Purchasing Officer, Panama Canal, until Feb. 25, for motor, air compressor, electric wire and cable, switch keys, panelboards, receptacles, sockets, flashlights, etc. (Panama Circular 1653.)

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Feb. 17 for 10,000 ft. incandescent lamp cord and 700 lb. magnet wire, for the South Brooklyn navy yard; also for 50,000 ft. lighting and power wire for the Mare Island yard (Schedule 3285.)

WASHINGTON, D. C.—Bids will be received by the Chief Signal Officer, United States Army, until Feb. 17 for one radiotelegraph transmitter, 2 kw. (Proposal C. P. 20141-1); also, at the same time, for 200 loud-ringing extension bells (Proposal C. P. 19821-1); until Feb. 21, for 120,000 ft. cross-connection twisted-pair wire, enameled silk-and-cotton-braid-insulated (Proposal 20098-1).

North Central States

BAD AXE, MICH.—The Michigan Electric Power Company is negotiating for the purchase of the electric system at Otter Lake, Fostoria, Millington, Otisville and North Lake.

LAPEER, MICH.—The plant and holdings of the Lapeer Gas-Electric Company have been acquired by the Michigan Electric Power Company, Bad Axe. Improvements are contemplated by the Michigan company in the local properties, to cost about $75,000, which will include the erection of a new transmission line into Lapeer and rebuilding the local system.

MOUNT PLEASANT, MICH.—The Consumers Power Company, Jackson, has submitted a proposal to the City Commissioners for extensions and improvements to the street-lighting system. The new plans provide for an increase of forty-seven street lamps.

READING, MICH.—The Southern Michigan Light & Power Company, Hudson, has acquired the municipal electric light and power plant and will furnish service here. The company is said to be planning extensions in its transmission lines in this district.

AKRON, OHIO.—The Northern Ohio Traction & Light Company contemplates extensions and improvements during 1925 involving an expenditure of about $2,000,000, of which one-half will be used for electric light and power extensions and the other half for street and interurban railway improvements.

CLEVELAND, OHIO.—The construction program of the Ohio Public Service, Cleveland, which operates throughout northeastern Ohio, calls for an expenditure of $1,585,000 during 1925 as follows: For replacement projects, $840,000; electric power stations, $210,000; transmission and distribution facilities, $35,000.

DAYTON, OHIO.—The Dayton Power & Light Company contemplates extensions and improvements during the coming year, to cost about $1,000,000.

DAYTON, OHIO.—The City Council is considering the installation of an ornamental lighting system on East Second Street from Jefferson to Kenton Street.

SPRINGFIELD, OHIO.—Extensions and improvements are contemplated by the Ohio Edison Company during the year as follows: For turbines, etc., $350,000; distribution lines, $195,000, and steam-heating distribution, $5,000.

PAINTSVILLE, KY.—Bids will be received by the city of Paintsville until Feb. 21 for complete pumping station, filter plant, motor-driven centrifugal pumps, steel storage reservoir, etc. The J. N. Chester Engineers, Union Bank Building, Pittsburgh, Pa., are engineers.

BROWNSTOWN, IND.—The Interstate Public Service Company, Indianapolis, is negotiating for the purchase of the properties of the Brownstown Water & Light Company and the Jackson County Transmission Company, which it will consolidate with its system. Extensions are planned in transmission lines in this section.

CANNELTON, IND.—The Lehman Manufacturing Company, manufacturer of toys, plans to install electric power equipment at its proposed new plant, to cost about $300,000.

ELGIN, ILL.—Bids will be received by the Board of Trustees of the Sanitary District of Elgin, 12 Spurling Block, until March 2 for furnishing equipment for two sewage stations complete, including electric motors, switchboards, starting apparatus and centrifugal pumps, etc. Pearse, Greeley & Hansen, 6 North Michigan Avenue, Chicago, are consulting engineers.

ASHLAND, WIS.—Approximately $1,000,000 will be expended by the Lake Superior District Power Company for extensions and improvements to its electric properties in Ashland, Hurley and other communities in northern Wisconsin. The work will include the installation of a new generating unit in the steam plant at Ashland and the Big Falls hydro-electric plant near Ladysmith.

GREEN BAY, WIS.—Extensions and improvements are contemplated by the Wisconsin Public Service Corporation during 1923, to cost about $1,740,000. The proposed work will include the construction of a new automatic hydro-electric plant at Sandstone Rapids, to cost about $800,000; installation of additional generating units at its Oshkosh and Manitowoc steam plants, to cost $120,000 and $50,000 respectively; a new substation at Marinette, $75,000; electric line extensions in Green Bay, Oshkosh, Marinette, Manitowoc, Sturgeon Bay, Chilton, Oconto and Dupree, $660,000.

LANCASTER, WIS.—The City Council is considering a proposal submitted by the Interstate Power Company, Chicago, offering to install an ornamental lighting system in the business section, consisting of sixty-four standards, mounted with a single lamp of 250 cp.

MADISON, WIS.—To meet the increasing demand for electrical service the Wisconsin Power & Light Company contemplates an expenditure of $1,502,824 for extensions and improvements during the year to its properties operating in 151 communities in south central Wisconsin.

TWO HARBORS, MINN.—The City Council is considering the installation of additional equipment at the municipal electric power plant. Charles Foster, Sellwood Building, Duluth, is engineer.

CEDAR FALLS, IOWA.—Plans are under way for the erection of a transmission line from the municipal electric plant for service in the farming districts near the city.

SIOUX CITY, IOWA.—The City Council is considering the installation of an electric lighting plant at the municipal pumping station to supply electricity for the public buildings.

SIOUX CITY, IOWA.—The Sioux City Gas & Electric Company is planning for the construction of additional units at its local power plant on Florence Street, now under construction. The cost is estimated at about $2,000,000.

MELBOURNE, IOWA.—The Melbourne Electric Company, recently incorporated, plans to supply electricity for lighting and power purposes in Melbourne. R. H. Flathers is president.

MEXICO, MO.—A construction program involving an expenditure of between $1,500,000 and $2,000,000 has been planned by the Missouri Power & Light Company for the purpose of connecting up all the Missouri properties. Work is already under way on extensions to the local plant. Connections will be made with the Keokuk plant by a transmission line extending from Vandalia to Center and between Wyaconda and Keokuk, for which material has been purchased. The lines from Wyaconda to Kirksville are being rebuilt for 33,000 volts to carry Keokuk power and also to include the towns of Lura, Granger and Arbela. Other projects in the northern part of the state will include the rebuilding of the line from Kirksville to La Plata, thence to Atlanta. Connections will be made between Bevier and Clarence. A line will be erected between Brookfield and Dawn which will connect with the Excelsior Springs group and will serve to connect up the western properties with those of the general and northern properties. Plans have been completed for the Booneville plant, which will be connected with Moberly by a 33,000-volt line.

Southern States

CATAWBA, N. C.—The Town Council has contracted with the Southern Power Company, Charlotte, to supply the town with electricity. The company will erect a 66,000-volt transmission line from the Lookout power plant. Bonds to the amount of $15,000 will be issued by the town.

WASHINGTON, N. C.—Extensions to the ornamental lighting system is under consideration by the Municipal Electric and Water Commission.

LAKE CITY, S. C.—The municipal electric light and power plant is reported to have been acquired by the South Carolina Power & Light Company. Extensions and improvements are contemplated by the purchasing company.

GRIFFIN, GA.—The Public Service Commission has granted the Georgia Hydro-Electric Company permission to issue 10,000 shares in capital stock and $520,000 in bonds, the proceeds to be used to acquire the power development at Towaliga Falls, near Griffin.

MACON, GA.—The Macon Railway & Light Company contemplates improvements to the railway and lighting departments during 1925, to cost about $104,000. About $30,000 will be expended in the Vineville district on construction of an outdoor substation and extending distribution lines into new territory.

HOHENWALD, TENN.—The Tennessee Electric Power Company, Chattanooga, has applied to the City Council for a franchise to install an electric lighting system here. It is also negotiating for the plants at Centreville and Dickson. If these plants are acquired, it proposes to erect a transmission line from Nashville to Hohenwald via Centreville and Dickson.

RICHARD CITY, TENN.—The Dixie Portland Cement Company is planning to install electric power equipment in connection with proposed mill extensions to cost about $200,000.

MOBILE, ALA.—The property of the Mobile Electric Company has been purchased by the Alabama Power Company, Birmingham, subject to the approval of the Public Service Commission. The Alabama company plans to erect new 110,000-volt transmission line from its hydro-electric plants on the Coosa and Tallapoosa Rivers, covering a distance of about 200 miles, work to begin as soon as approval of the sale is given by the Public Service Commission.

TUSCALOOSA, ALA.—The Alabama Power Company has secured a contract for the installation of an ornamental street-lighting system in the business section, to cost about $15,000.

STUTTGART, ARK.—The Arkansas Light & Power Company, Pine Bluff, is planning to rebuild its transmission line from Stuttgart to Arkansas.

NEW ORLEANS, LA.—The Louisville & Nashville Railroad Company, Louisville, Ky., plans to install electric power equipment at its proposed shops and terminal in the Gentilly section, to cost about $500,000. W. H. Courtenay is chief engineer.

COLORADO, TEX.—Plans are under consideration by the West Texas Electric Company, Sweetwater, to build a local ice factory and cold-storage plant, to cost about $75,000.

DALLAS, TEX.—The Dallas Power & Light Company has filed plans for the construction of a substation at Kelly and Sealy Streets, South Dallas, to cost about $249,000. The company also plans to build another substation in a different section of the city.

GRAPEVINE, TEX.—The Dallas (Tex.) Power & Light Company, Dallas, Tex., is reported to be planning to construct a transmission line from Palestine to Grapevine.

HOUSTON, TEX.—The Houston Lighting & Power Company contemplates extensions to its underground system.

Pacific and Mountain States

SEATTLE, WASH.—Plans are being prepared by the Puget Spund Power & Light Company for a substation to be erected at Twenty-first Avenue and East Madison Street, to cost about $147,000. The initial installation will have an output of 2,000 kw. and an ultimate capacity of 12,000 kw.

SPOKANE, WASH.—Extensions and improvements are contemplated by the Interstate Utilities Company, which operates telephone systems in twenty-four cities in Idaho, Washington and Montana, to cost

about $200,000. The work will include the erection of new copper circuits from Spokane and Mullan, the construction of several new exchanges, new equipment, etc.

TUMWATER, WASH.—Work has started on the erection of a new 50,000-volt transmission line by the Puget Sound Power & Light Company from Tumwater to the substation at Olympia. The line and substation at the Washington Veneer plant will cost about $18,000. The company also plans to erect a new substation in Tumwater during the summer, to have a capacity of about 2,000 hp.

WENATCHEE, WASH. — The Great Northern Railway Company, St. Paul, Minn., has applied to the Federal Power Commission for a license to erect a transmission line, 30 miles long, in the Wenatchee National Forest, connecting the Cascade tunnel with the power plant of the company.

BRAWLEY, CAL. — The Board of Trustees has rejected bids submitted for an electric generator, Diesel engine and pumping machinery and will either ask new bids at an early date or purchase the equipment separately.

COLTON, CAL.—The City Council plans to install a new lighting system on Eighth Street, to cost about $42,500.

COLUSA, CAL.—The Pacific Gas & Electric Company, San Francisco, plans to erect a transmission line between its Colusa and Maxwell substations and to install additional transformers, etc., at the Colusa substation.

LOS ANGELES, CAL. — Bids will be received by the Department of Public Service until Feb. 20 for a Diesel-engine-driven generating set.

LOS ANGELES, CAL. — Bids will be received by the Department of Public Service until Feb. 27 for telephone equipment (Specification P-346).

LOS ANGELES, CAL.—The City Council has authorized the installation of electric lamps installed on Virginia, Buckingham, Wellington Roads and Victoria Avenue. Also the installation of ornamental lamps, using pressed-steel posts, on Sixth, Bixel and Bonnie Brass Streets, West Lake and Commonwealth Avenues.

LOS ANGELES, CAL.—The Los Angeles Gas & Electric Corporation is planning extensions and improvements during 1925, to include additions to the Alameda Street power station, to cost $175,860; transmission line from Seal Beach station, with step-down substation, $1,000,000; extensions in electric distributing system, $2,757,000, including substations, equipment, shops, etc.

REDONDO BEACH, CAL. — The City Council will soon ask bids for the installation of an ornamental lighting system on South Catalina Street and the Esplanade, to cost about $90,000.

SAN BERNARDINO, CAL. — The City Council is considering installation of an ornamental street-lighting system on Arrowhead Avenue, to cost about $100,000; also a similar system on a portion of G Street.

SANTA PAULA, CAL. — The Moorpark-Conejo Irrigation District, recently organized, is considering the construction of a hydro-electric generating plant in connection with a proposed irrigation system.

STOCKTON, CAL.—The Pacific Gas & Electric Company, San Francisco, contemplates extensions and improvements to its local electric and water systems, to cost about $355,000.

TORRANCE, CAL.—The City Council is considering the installation of an improved lighting system on Torrance and Carson Streets, Western Avenue and other streets, to cost about $100,000.

OGDEN, UTAH.—Bids will be received at the office of the Purchasing Agent, Forest Service, Ogden, until Feb. 27 for furnishing No. 9 and No. 12 galvanized-iron telephone wire.

PHOENIX, ARIZ.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until March 2 for remodeling the electric passenger elevator in the United States post office and court house at Phoenix. For details see Searchlight Section.

YUMA, ARIZ.—Bids will be received at the office of the Bureau of Reclamation, Denver, Col., until March 12, for two hydraulic turbines, each to deliver 750 hp. when operating at a head of 10 ft. and 1,100 hp. when operating at a head of 14 ft.; two 1,000-kva. generators, four 667-kva. transformers, switching apparatus and lighting arrester for the Siphon Drop power plant of the Yuma power project, Arizona-California.

Electrical Patents

Announced by U. S. Patent Office

(Issued January 20, 1925)

1,523,398. METHOD AND APPARATUS FOR LOCATING FAULTS; O. O. Cessarini, Mahwah, N. J. App. filed Nov. 20, 1922. Between two conductors of a telephone cable.

1,523,402. TELEPHONE SYSTEM; E. H. Clark, New York, N. Y. App. filed Feb. 7, 1919. Line switch therefor.

1,523,403. ROTARY CONTROLLER; F. T. Cope, Salem, Ohio. App. filed Sept. 17, 1923. For controlling the current to an electric furnace or the fuel to a gas or oil furnace.

1,523,407. SWITCHING MECHANISM; H. F. Dobbin, New York, N. Y. App. filed Dec. 30, 1922. Co-ordinate switch as used in automatic telephone exchanges.

1,523,408. TESTING SYSTEM FOR TESTING SENDERS OF AUTOMATIC EXCHANGES; W. L. Dodge, Maplewood, N. J. App. filed Dec. 3, 1923.

1,523,411. SWITCHING DEVICE; O. F. Forsberg, Yonkers, N. Y. App. filed May 24, 1922. For use in connection with telephone or signaling systems.

1,523,412. TELEPHONE-EXCHANGE SYSTEM; C. B. Fowler, New York, N. Y. App. filed Sept. 23, 1919. Comprising manual and automatic exchanges.

1,523,423. ALTERNATING-CURRENT RELAY; J. F. D. Hoge, New York, N. Y. App. filed May 11, 1922. Designed to respond selectively to currents of a desired frequency.

1,523,428. TELEPHONE-EXCHANGE SYSTEM; C. W. Keckler, Newark, N. J. App. filed Dec. 31, 1919. Semi-automatic.

1,523,429. TELEPHONE SYSTEM; C. W. Keckler, Newark, N. J., and J. F. Dahl, East Orange, N. J. App. filed Oct. 29, 1920. Impulse-sending equipment.

1,523,434. ELECTRIC HEATER; E. N. Lightfoot, New York, N. Y. App. filed Oct. 25, 1920. Tubular type.

1,523,439. SELECTOR SWITCH; J. L. McQuarrie and C. L. Goodrum, New York, N. Y. App. filed Dec. 22, 1920. As used in automatic telephone-exchange systems.

1,523,446. TELEPHONE-EXCHANGE SYSTEM; L. Polinkowsky, Antwerp, Belgium. App. filed April 29, 1920. Automatic.

1,523,447. TELEPHONE-EXCHANGE SYSTEM; J. B. Retallack, East Orange, N. J. App. filed Nov. 21, 1923. Automatic.

1,523,468. CALLING DIAL; H. S. Woodruff, East Orange, N. J. App. filed Dec. 27, 1922. For automatic telephones.

1,523,473. REPEATER CIRCUITS; A. B. Clark, Brooklyn, N. Y. App. filed Sept. 28, 1922. Using vacuum tubes.

1,523,488. TELEGRAPH SIGNAL CIRCUITS; R. P. Moore, Dayton, Ky. App. filed March 11, 1922.

1,523,505. THERMOSTAT; S. G. Barnett, New York, N. Y. App. filed Sept. 30, 1921. Using bimetallic members.

1,523,516. ALTERNATING-CURRENT WAVE TESTER; H. G. Cordes, Bremerton, Wash. App. filed Dec. 30, 1920.

1,523,540. ELECTROMAGNETIC VIBRATOR; H. Hecht, Kiel, Germany. App. filed Nov. 1, 1921.

1,523,544. SOCKET FOR ELECTRIC LAMPS; O. Kufferman, Brooklyn, N. Y. App. filed Dec. 2, 1922. Electric candle sockets.

1,523,570. ELECTRICAL SWITCH; G. Winter and R. Winter, Manchester, England. App. filed Jan. 11, 1922. Plug type.

1,523,585. ELECTRIC CIGAR LIGHTER AND THE LIKE; C. H. Cuno, Meriden, Conn. App. filed July 19, 1924.

1,523,589. AUTOMATIC TELEPHONE SYSTEM; C. L. Goodrum, New York, N. Y. App. filed Sept. 22, 1919.

1,523,593. ELECTRIC WELDING AND THE LIKE; H. S. Holmes, New York, N. Y. App. filed Jan. 3, 1922. Using a solenoid to press the parts to be welded together.

1,523,599. METHOD OF AND MEANS FOR ATTACHING ELECTRICAL CONDUCTORS TO BRUSHES; A. Lindsblade, Bradford, Pa. App. filed July 15, 1921.

1,523,626. ELECTRIC HEATING ELEMENT FOR STOVES; C. C. Armstrong, Huntington, W. Va. App. filed March 18, 1924.

1,523,630. ARMATURE-WINDING MACHINE; P. E. Chapman, St. Louis, Mo. App. filed March 18, 1921.

1,523,631. ELECTRICAL OIL-BREAK SWITCH; P. Charpentier, Paris, France. App. filed Nov. 24, 1923.

1,523,641. CLOCK MECHANISM AND MEANS FOR WINDING SAID MECHANISM; J. W. Hansen and W. L. Hansen, Princeton, Ind. App. filed April 11, 1924.

1,523,647. GALVANIZING FURNACE; W. G. Imhoff, Pittsburgh, Pa. App. filed June 7, 1923.

1,523,650. DYNAMO-ELECTRIC MACHINE; E. H. Kocher, Boonton, N. J. App. filed Sept. 20, 1922. Designed for operation at very low potential.

1,523,664. ELECTRIC SWITCH; I. E. Smith, Stockton, Cal. App. filed April 17, 1922. Thermostatically or pressure-operated.

1,523,666, 1,523,667. ELECTRIC ARC WELDING; L. J. Steele, Portsmouth, England, and H. Martin and A. E. McCarthy, Southsea, England. App. filed Jan. 14, 1922. With automatic timing.

1,523,762. APPARATUS FOR REGULATING THE AMPLITUDE IN ELECTROMAGNETIC CLOCKS; M. P. Favre-Bulle, Boulogne, France. App. filed April 26, 1922.

1,523,764. ELECTRIC MOTOR; A. C. Gilbert, New Haven, Conn. App. filed April 27, 1921. Of small size as used in electric fans, etc.

1,523,771. MAGNETIC CHUCK; B. M. W. Hanson, Hartford, Conn. App. filed March 31, 1921.

1,523,776. ELECTRIC DISCHARGE DEVICE; A. W. Hull, Schenectady, N. Y. App. filed Jan. 29, 1920.

1,523,778. ELECTRON DEVICE AND METHOD OF OPERATING; A. W. Hull, Schenectady, N. Y. App. filed Nov. 15, 1921.

1,523,798. PERCEPTION OF RADIANT ENERGY; E. Benson, Newton Highlands, Mass., and Francis H. Williams, Boston, Mass. App. filed April 13, 1918. For signaling, telephony, etc.

1,523,803. GROUND DETECTOR; W. N. Goodwin, Jr., Newark, N. J. App. filed Aug. 10, 1920. For single-phase and polyphase circuits.

1,523,827. TRANSMISSION CIRCUITS; E. L. Nelson, East Orange, N. J. App. filed Aug. 31, 1922. For testing or service observing signaling systems.

1,523,836. AMPLIFYING SYSTEM; B. G. Pohlmann, Siemensstadt, near Berlin, Germany. App. filed March 26, 1921. For telephone lines.

1,523,839. METHOD OF REVERSING ELECTROMOTORS; R. Rüdenberg, Berlin-Grunewald, Germany. App. filed Aug. 9, 1921. Of the alternating-current-shunt type.

1,523,874. AUTOMATIC TRANSMISSION CONTROL SYSTEM; J. W. Horton, East Orange, N. J. App. filed Dec. 31, 1921.

1,523,891. TRANSFORMER FOR HIGH VOLTAGE; W. Petersen, Darmstadt, Germany. App. filed April 20, 1921.

1,523,892. BATTERY-DISCHARGE TEST SET; J. M. Peterson, Milwaukee, Wis. App. filed April 11, 1922. For testing batteries at high-discharge rates to determine their approximate capacity.

1,523,898. ELECTRICAL CIRCUIT FOR THERMIONIC DISCHARGE DEVICES; E. Reisz, Zehlendorf-Mitte, Germany. App. filed May 25, 1921. To increase the degree of amplification.

1,523,917. TIME-CONTROLLED ELECTRIC SWITCH; Y. B. Torkelsen, Brooklyn, N. Y. App. filed Jan. 31, 1924.

1,523,927. PROCESS AND APPARATUS FOR MAKING SPIRAL TUBING BY ELECTRIC WELDING; J. D. Beebe, Chicago, Ill. App. filed Oct. 11, 1923.

1,523,957. TELEPHONE CALL AND METHOD THEREFOR; R. E. Hall, Chicago, Ill. App. filed Aug. 13, 1919. For calling a wireless-telephone receiving station.

1,523,964. SIGNALING INSTRUMENT; H. Hörig, Stuttgart, Germany. App. filed Dec. 26, 1922. Horn.

1,523,974. SNAP-SWITCH CONSTRUCTION; H. E. Leppert, New Britain, Conn. App. filed March 6, 1923. Method of aligning and supporting the stationary or terminal contacts.

1,523,997. AUTOMATIC SYSTEM OF REGULATION; W. A. Turbayne, Niagara Falls, N. Y. App. filed March 6, 1916. For generator-storage battery system.

1,523,998. TELEPHONE SYSTEM; W. L. Dodge, Maplewood, N. J. App. filed Dec. 22, 1920. With means for controlling the transmission of current impulses for a plurality of trunk lines extending between widely separated offices.

(Issued January 27, 1925)

1,524,025. MOTOR TERMINAL BLOCK; Frederick Diehl, Elizabeth, N. J. App. filed May 12, 1920. For motors for certain classes of service, as sewing-machine motors.

1,524,075. ELECTRIC STOVE; Frank Yokel, Pittsburgh, Pa. App. filed Jan. 4, 1923. Using both radiation and convection for the distribution of heat.

1,524,124. CONSTRUCTION OF CABLES; Henry W. Fisher and Ralph W. Atkinson, Perth Amboy, N. J. App. filed July 2, 1920. For 10,000-volt or higher potentials.

1,524,129. AUTOMATIC TEMPERATURE REGULATOR; Andrew Grossman, New York, N. Y. App. filed Oct. 8, 1923. For heating incubators, etc.

Financial and Corporate

Market Is Irregular

Price Changes Once More Are Small in Week of Moderate Trading

A MIXTURE of relatively small gains and losses is what is shown by a compilation of net price changes for the past week in the market for power and light stocks. Notwithstanding the irregularity in price movement that still prevails, the undertone appeared on several occasions to be improving. The chief characteristic of the market of late has been not its weakness or its strength but its dullness. Trading activity is influenced more or less by movements on the New York Exchange.

On reports that the North American Company was likely soon to issue some favorable earning figures for the past year and that its January sales were running better than had been expected, the company's stock turned distinctly stronger and more active. Following the announcement from Washington that an investigation of the General Electric Company had been authorized by the Senate on account of its alleged monopoly of the power and power equipment business, the company's stock on Tuesday dropped from 243¼ to 235¾, a loss of more than $7 per share. The stocks of the American Gas & Electric Company and of the American Power & Light Company, which are identified with the Electric Bond & Share Securities Corporation, recently organized by the General Electric Company, also declined on that day, the former breaking two and three-eighths points, to 75½, and the latter one point, to 56½. On the announcement that the American Water Works & Electric Company probably would call the participating preferred stock, the latter issue on the Exchange improved in position several points and the common also turned stronger, the price rising as high as 39 on Saturday. Better buying also in Commonwealth Power Corporation's stock sent its price up.

New Capital Issues

Electric light and power public utility financing during the past week and a half has been extremely active, stocks, bonds and notes being represented in the new flotations. The Consolidated Gas Company of New York offered the largest single issue in the form of twenty-year gold debenture bonds totaling $50,000,000. The price of these 5½ per cent debentures was 100 and accrued interest. The New York Edison Company, the stock of which is owned by the Consolidated, issued first lien and refunding mortgage gold bonds to the amount of $30,000,000. This issue of bonds, bearing interest at the rate of 5 per cent and maturing in 1944, brings the total first lien and refunding mortgage bonds outstanding up to $60,000,000. Proceeds will be used to repay temporary obligations and to reimburse for large capital expenditures. The Kansas City Power & Light Company contributed $2,000,000 in first mortgage thirty-year gold bonds, priced at 97 and interest, to yield more than 5.20 per cent; the Texas Power & Light contributed a similar amount in first mortgage 5 per cent gold bonds, and likewise the Southwestern Power & Light in 6 per cent debenture bonds.

To raise funds to carry out its 1925 construction program the Puget Sound Power & Light Company offered a short-term issue of gold coupon notes amounting to $3,000,000 at 100 and interest. Among the new stock offerings were the West Penn Company 7 per cent cumulative preferred stock, amounting to $1,500,000, the price being 96½ to yield 7.25 per cent, and the Electric Investors, Inc., 90,000 shares of common stock of no par value at a price of $48 per share.

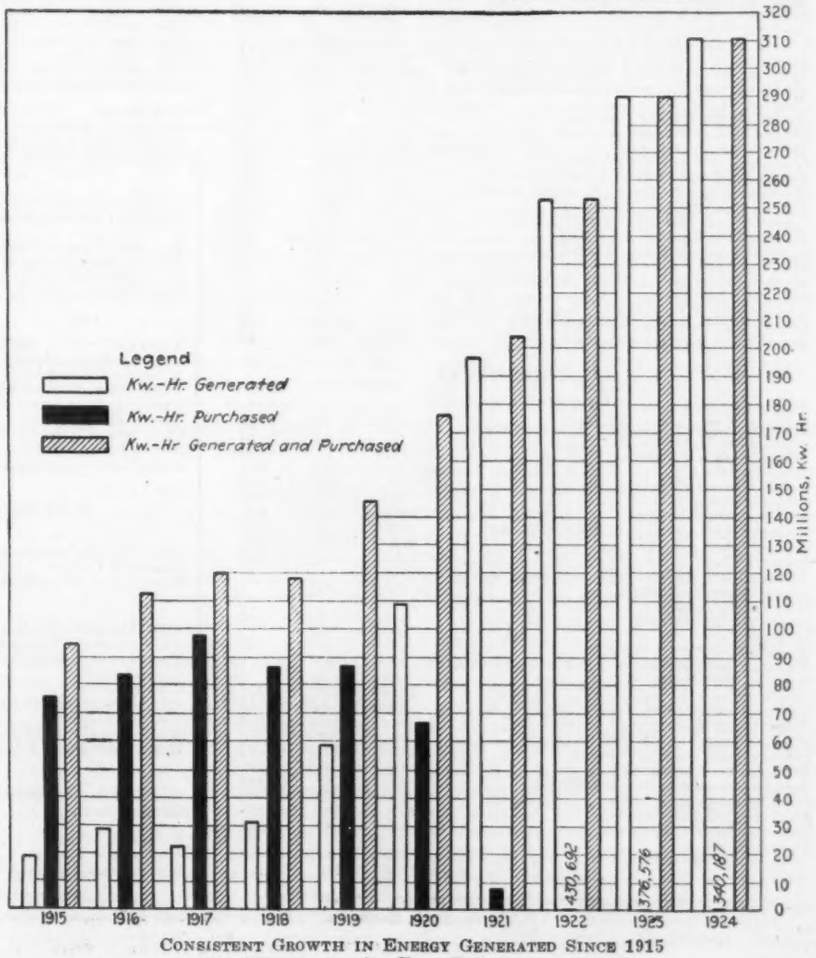
Kansas City Power & Light Company

Five Years Ago This Utility Purchased Most of Its Power, but Through Construction of a New Plant It Now Has Reduced Costs Greatly

BY PAUL WILLARD GARRETT

INVESTORS who study the Kansas City Power & Light Company's development during the last decade are likely to be impressed in two ways, by the growth in total business and by the increasing amount of its energy that the company has been able to generate.

The company's total of power generated and purchased rose steadily from 94,864,382 kw.-hr. for 1915 to 311,275,227 kw.-hr. for the twelve months ended November 30, 1924, which is to say that the volume of business was substantially more than trebled in the period. But in 1915 Kansas City Power



CONSISTENT GROWTH IN ENERGY GENERATED SINCE 1915
1924 Figures Are for Year Ended November 30

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stocks is $100.

Companies	Bid Price Saturday, Feb. 7	Low 1925	High 1925
PREFERRED STOCKS			
Operating Companies			
Adirondack Power & Light 7 per cent	99	98	101
Appalachian Power, 7 per cent	96	92	100
Arkansas Light & Power 7 per cent	94	92	98
Asheville Power & Light 7 per cent	a 99	99	100
Central Illinois Public Service 6 per cent	84½	84	87
Colorado Power 7 per cent	93	93	98
Connecticut Light & Power 7 per cent	105	105	110
Consumers' Power 6 per cent	90	90	93
Dayton Power & Light 6 per cent	94	88	100
Duquesne Light 7 per cent	a107½	105	107½
Eastern Texas Electric 6 per cent	100	100	105
Empire District Electric 6 per cent	78	78	85
Fort Worth Power & Light 7 per cent	a101	100½	102
Great Western Power 7 per cent	98	...	...
Illinois Northern Utilities 6 per cent	84	82	87
Illinois Power & Light 7 per cent	94	92½	98
Kansas Gas & Electric 7 per cent	a 98	98	100
Long Island Lighting 7 per cent	103	100	105
Minnesota Power & Light 7 per cent	a 96	96	98
Mississippi River Power 6 per cent	87½	87½	90
Nebraska Power 7 per cent	a 98	98	100
Niagara Falls Power 7 per cent—25	a 28½	28	29
Niagara, Lockport & Ont. Power 7 per cent	106	101½	110
Northern States Power 7 per cent	97	95	99
Ohio Public Service 7 per cent	97½	97	100
Pacific Gas & Electric 6 per cent	95	92	97
Pacific Power & Light 7 per cent	a 98	98	100
Penn-Ohio Power & Light 7 per cent	94	91	97
Pennsylvania Power & Light $7—no par	a101	100	101½
Penn. Public Service 7 per cent	90	90	100
‡Philadelphia Electric 8 per cent—25	41½	40	44½
Southern California Edison 8 per cent	115	115	120
Tennessee Electric Power, 6 per cent	81½	80	84
Texas Power & Light 7 per cent	a100	100	101
Utah Power & Light 7 per cent	a 98	97½	99
Western States Gas & Electric 7 per cent	82	82	85
Yadkin River Power, 7 per cent	a 99	98½	100
Holding Companies			
American Gas & Electric 6 per cent—50	45	45	47½
American Light & Traction	93½	93	95½
American Power & Light 6 per cent	87½	86	90
American Public Service 7 per cent	88	88	92
American Public Utilities 7 per cent	87	87	95
American Water Works & Electric 7 per cent	a102	95½	102
Associated Gas & Electric 7 per cent—1 per cent extra—50	a 50	...	...
Carolina Power & Light 7 per cent	100	100	105
Central Indiana Power 7 per cent	88	88	93
Cities Service 6 per cent	80	80	81½
Commonwealth Power 6 per cent	80	80	82½
Consolidated Gas 6 per cent—50	57½	57½	58½
Continental Gas & Electric 7 per cent pr. pf.	91	89	95
Electric Bond & Share 6 per cent	102	102	103½
General Gas & Electric—$8—no par	105	104½	110
*Middle West Utilities 7 per cent	93½	91½	94½
National Power & Light—$7—no par	97	95	98
North American 6 per cent—50	a 47½	46½	47½
Public Service Corp. of N. J. 7 per cent	100	...	...
Public Service Corp. of N. J. 8 per cent	111	...	...
Standard Gas & Electric 8 per cent—50	51½	49	52
‡United Gas Improvement—50	58	57	58
United Light & Power—$6.50—no par	86	83	88
COMMON STOCKS			
Operating Companies			
Adirondack Power & Light—50	34	33	38
Appalachian Power—no par	73	70	83
Arkansas Light & Power	65	65	70
Brooklyn Edison	a130	120½	133
Buffalo General Electric	197	197	199
Colorado Power	93	93	98
*Commonwealth Edison	135½	134½	139
§Consolidated Gas, Electric Light & Power	32½	32	34
Dayton Power & Light	200	180	215
Detroit Edison	115	110	115
‖Edison Electric Illuminating of Boston	a200½	...	...
Kentucky Hydro-Electric	a 92½	85½	92½
Long Island Lighting	200	...	...
Mississippi River Power	37	37	40
Montana Power	69	67½	72
Niagara Falls Power—no par	46	43	48
Niagara, Lockport & Ontario Power—no par	70	63	73
Northern Ohio Power	6	5	7½
Northern States Power	104½	103	107
North Texas Electric	64	64	67
Pacific Gas & Electric	a104½	102½	105
‡Penn Central Light & Power—no par	62	60	62
§Pennsylvania Water & Power	132	126½	132½
‡Philadelphia Electric—25	41½	40½	45½
Public Service Co. of Northern Illinois	97	97	100
Puget Sound Power & Light	53	53	58
Southern California Edison	103	102	106
Tennessee Electric Power—no par	49	49	61
Virginia Power	74	74	92
Virginia Railway & Power	a 68½	64½	69½
West Penn. Co.	119½	110	119½
Holding Companies			
American Gas & Electric—no par	75	72	80
American Light & Traction	144½	139	147
American Power & Light	57½	55	67
American Public Utilities	75	75	85
American Water Works & Electric	a 38	34½	39½
Carolina Power & Light—no par	290	290	335
Cities Service	190	172	192
Columbia Gas & Electric—no par	a 48½	45½	49½
Commonwealth Power Corp.—no par	118	116	126
Consolidated Gas—no par	a 78½	75¼	78½
Continental Gas & Electric	80	80	87
Federal Light and Traction	a137	114½	140
General Gas & Electric	75	75	81
Lehigh Power Securities—no par	106	105	116
*Middle West Utilities—no par	86½	84½	90
National Power & Light—no par	199	185	230
North American—10	a 45	41½	45
Philadelphia Co.—50	a 54½	53	57½
Power Securities—no par	17	...	...
Public Service Corp. of N. J.—no par	a 72	67½	72
Standard Gas & Electric—no par	a 43½	40½	46
United Gas & Electric (Conn.)—no par	32	32	37½
Utah Securities	a 49½	42	53
BONDS			
Operating Companies			
Adirondack Power & Light 6s	1950	102½	102½ 103½
Alabama Power 5s	1946	96½	96 97
Appalachian Power 5s	1941	97	96 97
Brooklyn Edison 5s	1949	99½	99½ 100
6s	1930	105	104½ 105
Cleveland Electric Illuminating 5s	1939	100½	100 101½
Commonwealth Edison 5s	1943	100	99½ 100½
5s	1953	98½	98½ 99½
§Consol. Gas, Elec. Lt. & Pwr. 4½s	1935	95½	95½ 96½
6s	1949	105½	104½ 105½
Consumers' Power 5s	1936	99	99 99½
5s	1952	a 94½	90½ 94½
Detroit Edison 5s	1933	101½	100 102½
Duquesne Light 6s	1949	a106	105 106½
Great Western Power 5s	1946	96	95 96
Kansas City Power & Light 5s	1952	96½	95½ 97½
Mississippi River Power 5s	1951	97½	96½ 97½
Montana Power 5s	1943	99	97½ 99½
New England Power 5s	1951	100½	100½ 101½
New York Edison 6½s	1941	114½	112½ 115
Niagara Falls Power 6s	1950	105	105 106½
Northern States Power 5s	1941	94½	93 94½
6s	1941	104	103 105½
Ohio Power 7s	1951	106½	106½ 107½
Pacific Gas & Electric 5s	1942	96	93½ 96
Pennsylvania Water & Power 5s	1940	100	99½ 100½
‡Philadelphia Electric 5s	1966	100½	100½ 102
5½s	1947	104½	103½ 104½
6s	1941	106½	106 106½
Portland Electric Power 6s	1947	a 98½	... ...
Southern California Edison 5s	1939	99½	99½ 100
6s	1944	102½	102½ 103½
Tennessee Electric Power 6s	1947	100½	99½ 101
Texas Power & Light 5s	1937	97½	97 98
Toledo Edison 7s	1941	109½	108½ 109½
Utah Power & Light 5s	1944	93½	91 93½
Holding Companies			
Alabama Traction, Light & Power 5s	1962	85	85 87½
American Gas & Electric 6s	2014	97	96½ 97
American Power & Light 6s	2016	94½	94 95
Amer. Water Works & Electric 5s	1934	95½	92½ 95½
Central Indiana Power 5s	1947	97½	95½ 97½
Commonwealth Power 6s	1947	100½	97½ 100
Consolidated Cities Lt., Pwr. & Tr. 5s	1962	75	75 76½
Illinois Power & Light 6s	1953	100½	100½ 101½
United Light & Railways 5s	1932	95	93½ 95
6s	1952	97½	95½ 97½
ELECTRICAL MANUFACTURING COMPANIES			
PREFERRED STOCKS			
Allis-Chalmers Manufacturing	a106½	103½	107
*National Carbon	120	120	124
Worthington Pump & Machinery A	a 86½	85	88
COMMON STOCKS			
Allis-Chalmers Manufacturing	a 78	71½	82½
American Bosch Magneto—no par	a 42½	33	54½
Electric Storage Battery—no par	c 65½	62½	70½
General Electric	a245½	241½	320
General Electric—10	a 11½	11	11½
*Hurley Machine—no par	51	50	56
†Wagner Electric	35	26½	47½
Westinghouse Electric & Manufacturing—50	a 73½	71½	84
Worthington Pump & Machinery	a 68½	62½	79½
BONDS			
Canadian General Electric 6s	1942	107½	107½ 107½
General Electric 3½s	1942	84	83 84
5s	1952	103½	101½ 105½
Robbins & Myers 7s	1952	70½	67 73½
Western Electric 5s	1944	98½	98½ 99
Westinghouse Electric & Mfg. 7s	1931	108	107½ 108½

*Chicago Stock Exchange. †St. Louis Stock Exchange. ‡Philadelphia Stock Exchange. ‖Boston Stock Exchange §Baltimore Stock Exchange.
a Bid price Monday, February 9.

& Light generated only 18,821,757 kw.-hr. as compared with its purchase of 76,042,625 kw.-hr. The relative volume of power generated grew year by year, however, until in 1920 the power generated by the company itself exceeded that purchased. In the twelve months ended November 30, 1924, the company generated 310,935,040 kw.-hr. as against its purchase of only 340,187 kw.-hr. The company's change from a purchaser of power to one that now generates virtually all of its own energy began long ago, but was hastened, of course, by completion of the well-known Northeast power plant, of which the first five units went into service about five years ago. A part of the company's more recent prosperity is explained by the reduction in costs that was effected by this plant.

The Kansas City Power & Light Company was organized in 1922 as a consolidation of the Kansas City Power & Light Company and the Carroll County Electric Company. It does the entire central-station business in Kansas City, Mo., and sells energy in twenty-one surrounding counties.

As a means of showing the diversity of the industry reflected in the company's electrical output, President Joseph F. Porter recently pointed out that no one group contributes more than 16.2 per cent of the total kilowatt-hour sales, the high group being "business lighting." "Residence lighting" contributed 13.3 per cent, "flour mills and grain elevators" 12.5 per cent, and "combined power and light" 10.1 per cent. He said that the industrial diversity of the territory is also reflected in the fact that during the twelve months ended November 30, 1924, "the company's average electric load amounted to more than 50 per cent of its peak load, which is a favorable showing."

Conservative Financial Set-Up

Except for an unimportant amount ($150,000) of underlying real-estate bonds, the company's first mortgage bonds, presently to be outstanding to the amount of $25,000,000, constitute its entire funded debt. That these bonds occupy an unusual position is indicated in several ways. Interest charges are being earned between three and four times. Although the company since 1920 has put something like $14,000,000 of junior money into the property, the debt has been increased only $8,000,000. In 1924 the company appropriated 11 per cent of gross earnings for depreciation alone.

The company's preferred series A $7 stock is outstanding to the amount of 110,000 shares and the common stock at 250,000 shares. The bonds mentioned above and the two classes of stock make up the present capitalization. With a property valuation estimated at $42,350,000, the company thus shows a value of $17,000,000 in excess of its funded debt. The position of the securities has been greatly improved by the fact that the company has been able to show increasing amounts of net earnings before depreciation, that figure having grown from $2,228,011 in 1920 to $4,863,032 for the twelve months ended November 30, 1924.

The Kansas City Power & Light Company's first mortgage is one of the "open-end" mortgages of the type that has lately come into vogue.

Standard G. & E. Customer-Ownership Sales Gain

Consistent gains have been recorded in the customer-ownership sale of preferred shares at the operated public utility properties of Standard Gas & Electric Company since the adoption of this important policy in 1915, and the year 1924 proved to be no exception to the rule. All previous records were broken by the sale of $19,284,200 par value of preferred shares in 35,884 separate transactions—a gain of 47 per cent over the previous record, established in 1923. Of this total only 17,570 shares, or approximately 9 per cent, were made on the monthly investment plan, with a minimum payment of $5 a share per month.

SALES OF PREFERRED SHARES IN 1924 BY COMPANIES PRACTICING CUSTOMER OWNERSHIP

	Sales	Shares
Coast Valleys Gas & Electric	131	1,585
Louisville Gas & Electric	6,435	35,602
Northern States Power	21,472	100,452
Oklahoma Gas & Electric	4,108	27,138
San Diego Cons. Gas & Electric	1,296	12,913
Southern Colorado Power	799	3,152
Western States Gas & Electric	1,643	10,990
Total	35,884	192,342

The total of $19,284,200 par value represents all sales, less only cancellations. Of this amount, 22.33 per cent represents the turnover of stock on a resale basis and the balance, $14,977,300 par value, is the net total of sales from treasury. There were 35,884 separate transactions, representing an average par value sale of $537.

The accompanying tabulation shows the sale of preferred shares in 1924 by each of the companies practicing customer ownership.

Importance of Co-operation with Bankers

Broader View of the Industry's Requirements Has Resulted from Intimate Contact Established Between Public Utility Managements and Investment Bankers

By Ralph S. Child
With Bonbright & Company, Ltd., Investment Bankers, New York

PUBLIC utility financing was formerly largely done through first mortgage sinking-fund bonds. It was a case of the utility desiring to borrow money on a bond issue and making the best trade possible with the investment banking house to borrow that money. Consequently there was a lack of mutual understanding of the problems of each party to the transaction. The banker then was not so well informed as now as to the value of diversified electric power load. Of public relations he knew almost nothing. If the physical property had value materially in excess of the bonds, if the franchise extended beyond the life of the bonds and gave the company the right to charge for its services rates that would return a profit, and if the sinking-fund and interest payments were met promptly, the banker as a rule gave little further thought to the business of that particular utility company.

The public utility management, on the other hand, generally looked upon the investment banker as a necessary evil to be resorted to for help to provide money to refund maturing issues or to aid in financing the growth of the business. As a rule, after consummating the negotiations for a loan, the public utility executive never saw the banker from one year's end to the other—that is, so long as his company lived up to the covenants of the mortgage.

Fortunately for the public utility industry, such conditions as these are a thing of the past. Today almost without exception there is active co-operation between the principal investment banking firms who handle public utility securities and the managements of the companies whose bankers they are. This co-operation no doubt has been brought about by the unprecedented growth of the business, particularly in the power and light and gas divisions, which have required, as already outlined, capital in increasing amount to take care of their development.

The fact that the financial structures of most utility companies formerly were of such a nature that the financing of this growth was impossible has made necessary the revision of these structures along lines which were more comprehensive and elastic. This necessity has brought the investment bankers and the public utility managements closer together, both sides have obtained a broader view of the requirements of the industry, and they have worked with one another to develop plans which would assure the financing of the growth of the business along sound and constructive lines.

There are now in this country numerous investment banking firms that for many years have specialized in the securities of public utility companies. These firms as a rule maintain organizations for the investigation and study of utility properties and their problems, some of them going to the extent of making surveys and analyses of certain phases of the industry calculated to be of assistance in judging various trends which have important bearing on the future of the industry. In this way the investment bankers today serve a far different purpose and bear a far different relation to the public utility industry from the purpose and relation in past years. Because of their intensive studies of utility problems and a closer co-operation with the managements they have a far broader conception of the business and are in a position, through the interchange of ideas—especially in the matter of progressive policies advantageously adopted by individual companies—to be of con-

siderable assistance in ways other than simply the making of a loan.

The public utility banker today who has the interests of the industry at heart realizes that in his connection with a given public utility the question of "service" enters in—that it is not only a question of making a well-secured loan upon which there is every assurance that the interest and principal will be paid, but that, as is becoming more generally recognized, the public utility industry itself is rendering a service to the people of this country, and that in financing the requirements of that industry the banker too is engaged in rendering a service to the people of this country. Of course, it is sound business that this service should carry a compensation with it, both for the public utility and for the banker, but the idea which ofttimes prevailed that financial profit was the first and in many cases the only consideration both for the utility and for the banker fortunately no longer exists, or, if it does, only in extremely isolated cases.

Company Reports

Among the company reports recently issued for the month of December were the following:

Name of Company	Gross Revenues for December 1924	1923
Bangor Railway & Electric	$141,487	$138,802
Binghamton Light, Heat & Pwr.	134,008	119,277
Grafton County Elec. Lt. & Pwr.	21,296	19,028
Los Angeles Gas & Electric	1,907,879	1,573,340
New Bedford Gas & Edison Lt.	344,722	326,861
Philadelphia Company	4,317,632	3,626,849
Rutland Railway, Light & Pwr.	45,625	45,843
Sayre Electric	24,756	20,575
Vermont Hydro-Electric	62,864	55,648
Washington Water Power	488,030	462,416

Dividends Declared

The following dividends were recently announced by electric light and power companies:

Name of Company	Per Cent	When Payable
Central Arkansas Ry. & Lt., pf.	1¾	Mar. 2
Central Miss. Valley Elec. Prop., pf	1¾	Mar. 2
Cleveland Elec. Illumin., 6% pf.	1½	Mar. 2
Federal Light & Traction, com.	$1	Apr. 1
Federal Light & Traction, com, ex*	75c	Apr. 1
Federal Light & Traction, pf.	1½	Feb. 28
Georgia Railway & Power, com.	1	Mar. 1
Georgia Ry. & Power, 6% 1st pf.	2	Apr. 1
Georgia Ry. & Power, 7% 1st pf.	1¾	Apr. 1
Georgia Ry. & Power, 2d pf.	1	Mar. 1
Georgia Ry. & Power, 2d pf.	1	June 1
Georgia Ry. & Power, 2d pf.	1	Sept. 1
Georgia Ry. & Power, 2d pf.	1	Dec. 1
Portland Electric Power, 2d pf.	1½	Mar. 2
Southern California Edison, com.	2	Feb. 16
Utica Gas & Electric, pf.	1¾	Feb. 15

*Payable in preferred stock.

Johns-Manville Report.—The report of Johns-Manville, Inc., for the year 1924 shows net profit of $2,223,047 after all expenses, charges and reserves for taxes, against $3,078,928 in 1923. This net profit was equal to $8.89 a share earned on the 250,000 shares of no-par-value stock outstanding, against $12.31 a share earned on the capital stock in 1923.

Long Island Lighting Changes Par of Stock.—The Long Island Lighting Company has filed a certificate with the Secretary of State at Albany changing its authorized common stock from 100,000 shares, par $100, to 1,000,000 shares of no par value.

Annual Report of Brooklyn Edison Company

The annual report of the Brooklyn Edison Company for 1924, recently issued, shows that the company is more than maintaining the rate of growth that has characterized it for the last five years since M. S. Sloan became the president. Gross revenue increased in 1924 to $26,030,840 from $23,422,313 in 1923 and net income to $7,059,011 in 1924 from $5,714,402 in 1923. The earnings per share, which were $9.97 in 1923, after deducting the reserve for contingencies, increased to $10.98 in 1924. After all deductions the report shows a net increase in the surplus of $810,931.

During the year an increase in the capital stock from $50,000,000 to $75,000,000 was authorized. Of the new stock $16,000,000 was offered to existing stockholders and all subscribed for, while the remainder was held in the treasury. There was also authorized an issue of $25,000,000 5 per cent general mortgage bonds.

The company has now an authorized capitalization in stock and bonds of $120,000,000, of which $105,000,000 is outstanding, divided into $60,000,000 common stock and $45,000,000 bonds. Of the bonds $8,500,000 are 6 per cent, $4,275,000 4 per cent and the remainder 5 per cent.

Brooklyn Edison stands in an enviable position in its dividend record. It has paid dividends without interruption for twenty-five years, 6 per cent to 1903 and 8 per cent since June, 1903. The available records show only eight electric utilities with a capitalization of $10,000,000 or over that have paid dividends without interruption for twenty-five years or more.

In November the Brooklyn Edison Company purchased from the Flatbush Gas Company for $4,200,000 the electric franchise, distribution system, etc., of the latter company, covering the Twenty-ninth Ward of Brooklyn. By this purchase Brooklyn Edison not only added 45,000 meters to its system but became the only company authorized to manufacture, sell and distribute electrical energy for lighting and power in Kings County. The total number of meters added to the system in 1924 was approximately 150,000. The company now has more than 500,000 meters on the lines. Sales for 1924 were more than 500,000,000 kw.-hr., an increase of 55,000,000 kw.-hr. over 1923. During the year the new Hudson Avenue generating station was placed in commission with three units of 50,000 kw. each. When completed, this station, one of the largest steam-turbine generating plants in the world, will have eight units with a total capacity of between 500,000 hp. and 600,000 hp.

At the end of the year the company announced a voluntary reduction in the maximum price of energy from 8 cents to 7½ cents per kilowatt-hour. This reduction means a saving of more than $1,000,000 a year to the residents of Brooklyn in the cost of their electricity.

Virginia Power Approves Appalachian Proposal. — The stockholders of the Virginia Power Company have approved the proposal of the Appalachian Securities Corporation, discussed at length in the January 24 issue of the ELECTRICAL WORLD, to purchase the assets of the former for an issue of 82,000 shares of the first preferred stock of the Appalachian Securities. The latter will consolidate with the American Gas & Electric Company if stockholders of both organizations approve.

Torrington (Conn.) Company Seeks Capital Increase. — The Torrington (Conn.) Electric Light Company, is seeking legislative authority to increase its capital from $750,000 to $2,000,000.

Public Service Company Closes Successful Campaign.—In the customer-ownership campaign ended January 31, the most successful of the six campaigns since 1921, the Public Service Corporation of New Jersey sold 77,572 shares of the 7 per cent cumulative preferred stock to 19,545 subscribers throughout New Jersey. These figures bring the total number of shares of 7 and 8 per cent cumulative preferred stock sold by this method up to 260,000.

Jersey Commission Approves $15,000,000 Issue.—The Board of Public Utility Commissioners of New Jersey approved the issuance of 6 per cent cumulative preferred stock of the Public Service & Electric Company to the amount of $15,000,000 in lieu of 1,500,000 shares of unissued no-par-value stock. In order to effectuate the purpose of the petition it was necessary to revoke the approval given by the board December 4, 1924, for the issuance of 1,500,000 shares of common stock.

Kelvinator Corporation Stock Offer.—The Kelvinator Corporation, Detroit, has concluded a merger with the Detroit Carrier & Manufacturing Company, as was announced in last week's issue of the ELECTRICAL WORLD. Through Bonner, Brooks & Company and Noyes & Jackson of New York a public offering of 50,000 shares of stock was made at $16 per share, to net about 9½ per cent and was heavily oversubscribed. The new company carries the name of the Kelvinator Corporation and is capitalized at 400,000 shares. The Detroit Carrier Company was purchased for 100,000 shares, the old Kelvinator concern for 100,000 shares, 50,000 have been offered by the bankers and the balance is in the treasury of the company. The new company has no preferred stock, bonds or bank loans outstanding.

American Water Works to Retire Stock.—The American Water Works & Electric Company is planning to retire its 6 per cent participating preferred stock to the amount of $10,000,000, according to an announcement made by H. Hobart Porter, president. The call will probably not be made before the early spring.

Puget Sound Company to Change Set-Up. — The stockholders of the Puget Sound Power & Light Company at the annual meeting to be held March 3 will vote on the proposal to change the par value of the preferred stock from $100 to no par and to authorize 40,000 additional shares.